FINAL

CORRIDOR SYSTEM MANAGEMENT PLAN (CSMP)

LOS ANGELES COUNTY I-210 CORRIDOR COMPREHENSIVE PERFORMANCE ASSESSMENT

May 28, 2008

System Metrics Group, Inc.

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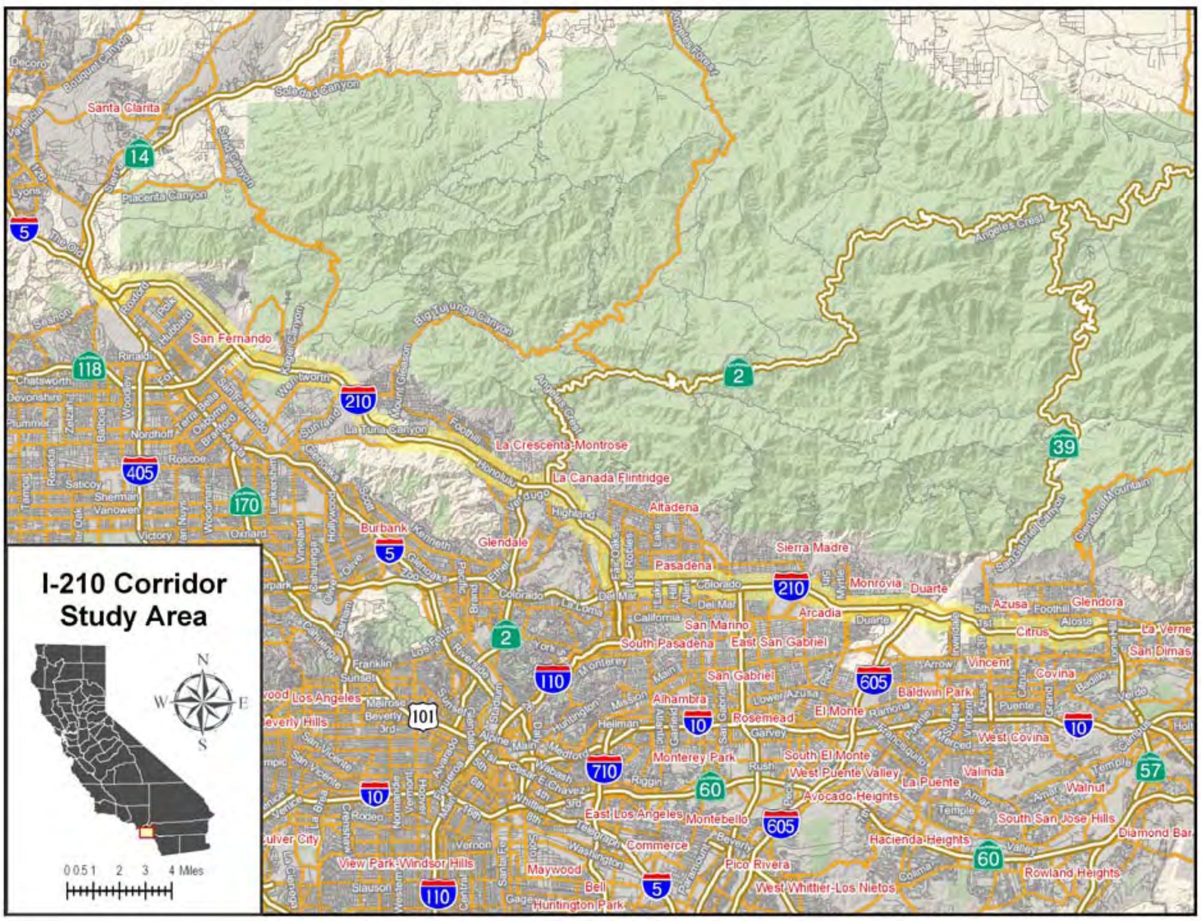
1. INTRODUCTION

The draft I-210 Corridor System Management Plan (CSMP) Existing Conditions Performance Assessment report provides a comprehensive corridor-wide performance assessment of the I-210 freeway in Los Angeles County. The I-210 study corridor extends from the I-5 junction to the SR-57 junction – a distance of approximately 45 miles, focusing on the congested urban section between the SR-134 junction and the SR-57 junction – a distance of approximately 20 miles. The study corridor is highlighted in Exhibit 1.

Exhibit 1: Map of Study Area



The purpose of the corridor-wide performance assessment is to collect and analyze all information necessary to understand the existing traffic conditions. This report details findings of the causes of traffic congestion along the corridor and identifies freeway bottlenecks. The performance measures of mobility, reliability, safety, and productivity implications of congestion caused by those bottlenecks are estimated. This report is comprised of three sections:

1. Corridor Description –corridor roadway and other transportation infrastructure including:

- Corridor roadway facility description and geometrics;
- Description of recent roadway improvements;
- Transit network including Metrolink commuter service, Los Angeles County Metropolitan Authority (Metro) bus and rail service, and Foothill Transit service;
- Major traffic trip generators along the corridor.

2. Existing Conditions – preliminary assessment of all currently available traffic performance data for initial evaluation of the existing traffic conditions, focusing on four key travel performance measures:

- *Mobility* - describes how well the corridor moves people and freight;
- *Reliability* - captures the relative predictability of the public's travel time;
- *Safety* - captures the safety characteristics such as collisions; and
- *Productivity* – describes the productivity loss due to inefficiencies in the corridor.

3. Bottleneck Analysis – evaluation of existing recurrent traffic congestion in the corridor. Freeway bottleneck locations that create mobility constraints are identified and documented, and their relative contribution to corridor-wide congestion is reported.

Existing Data Sources

The existing available data analyzed for the existing conditions performance assessment includes the following sources:

- Caltrans HICOMP report and data files (2004 – 2006)
- Caltrans Freeway Performance Measurement System (PeMS)
- Caltrans District 7 probe vehicle runs (electronic tach runs)
- Caltrans Traffic Accident Surveillance and Analysis System (TASAS)
- Traffic study reports (various)
- Aerial photographs (Google Earth) and Caltrans photologs
- Internet (i.e. Metro website, Metrolink website, Foothill Transit website, etc)

Details of each data source used are provided in their applicable sections of this report.

2. CORRIDOR DESCRIPTION

The Los Angeles County I-210 corridor begins from the I-5 (Golden State Freeway) interchange in San Fernando to the SR-57 (Orange Freeway) interchange. The I-210 corridor extends approximately 45 miles from the I-5 interchange to the SR-57 interchange. It traverses through the cities of San Fernando, La Canada Flintridge, Pasadena, Arcadia, Monrovia, Duarte, Azusa, and San Dimas.

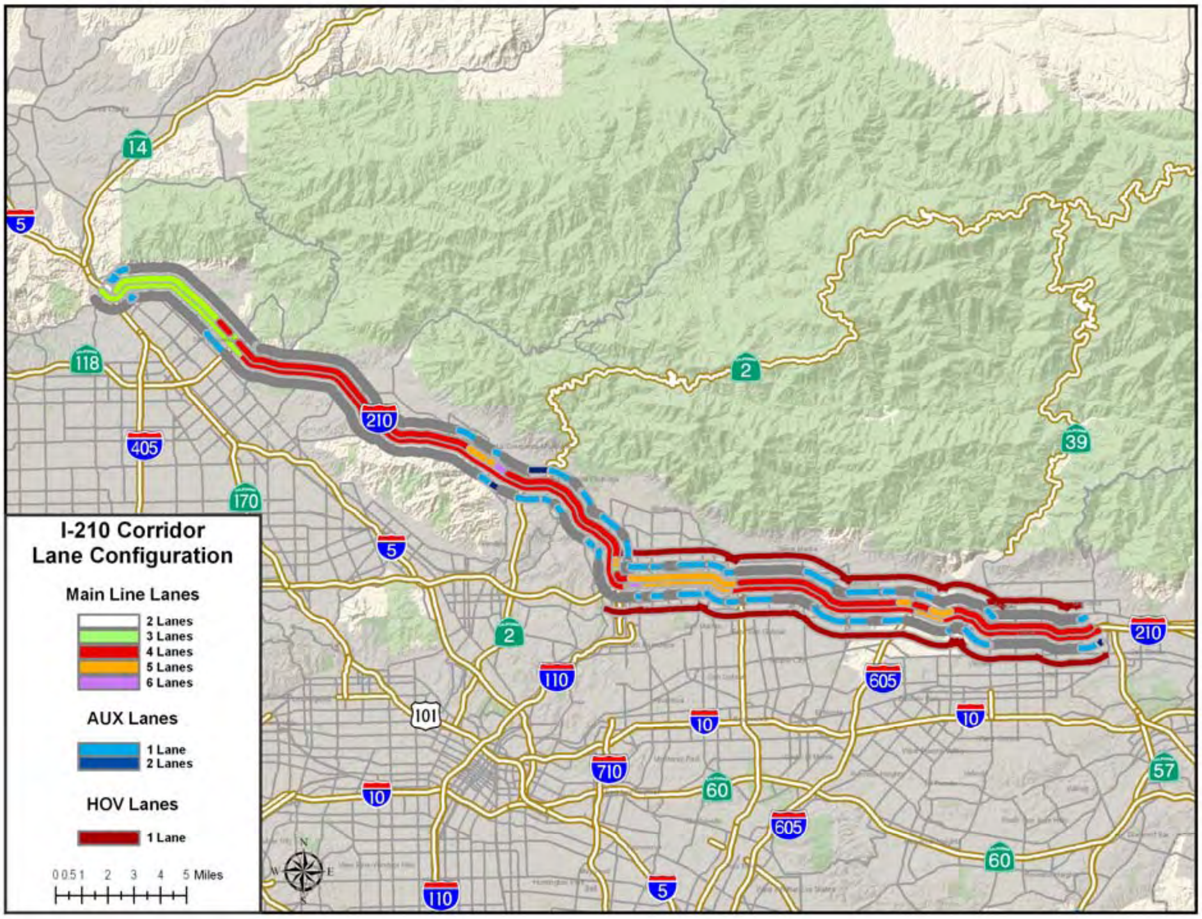
Corridor Roadway Facility

The study corridor traverses a large portion of the northern section of Los Angeles County and connects several of the major communities. The corridor includes 45 miles of I-210 from its beginning at the I-5 junction (postmile R0) in Sylmar through Sunland, Glendale, La Crescenta, La Canada Flintridge, Pasadena, and San Gabriel Valley to SR-57 junction (postmile R45). The LA-210 corridor intersects many of the key north-south corridors in Los Angeles County. The major interchanges in the I-210 study corridor include the following:

- I-5 which provides north-south connection throughout the entire State as well as the Los Angeles County
- SR-118 which provides east-west connection from the I-210 freeway/San Fernando to Ventura County
- SR-2 (Glendale Freeway) which provides north-south access from Foothill Boulevard to the downtown Los Angeles area
- SR-2 (Angeles Crest Highway) which provides access through the Angeles National Forest
- SR-134 (Ventura) which provide connection to the west with the US-101 freeway and to the south with Long Beach
- Lake Avenue which is a major north-south arterial traversing through the cities of Altadena, Pasadena, and South Pasadena
- SR-19 (Rosemead Boulevard) which provides access to the San Gabriel Valley and south Los Angeles areas
- Santa Anita Avenue which is a major north-south arterial traversing through the cities of Arcadia, Temple City, and El Monte
- I-605 (San Gabriel River Freeway) which provides north-south access from Historic Route 66 to Orange County connecting to the I-405 freeway
- SR-57 which provides north-south connection to Glendora, San Dimas, Pomona, Diamond Bar, and Orange County

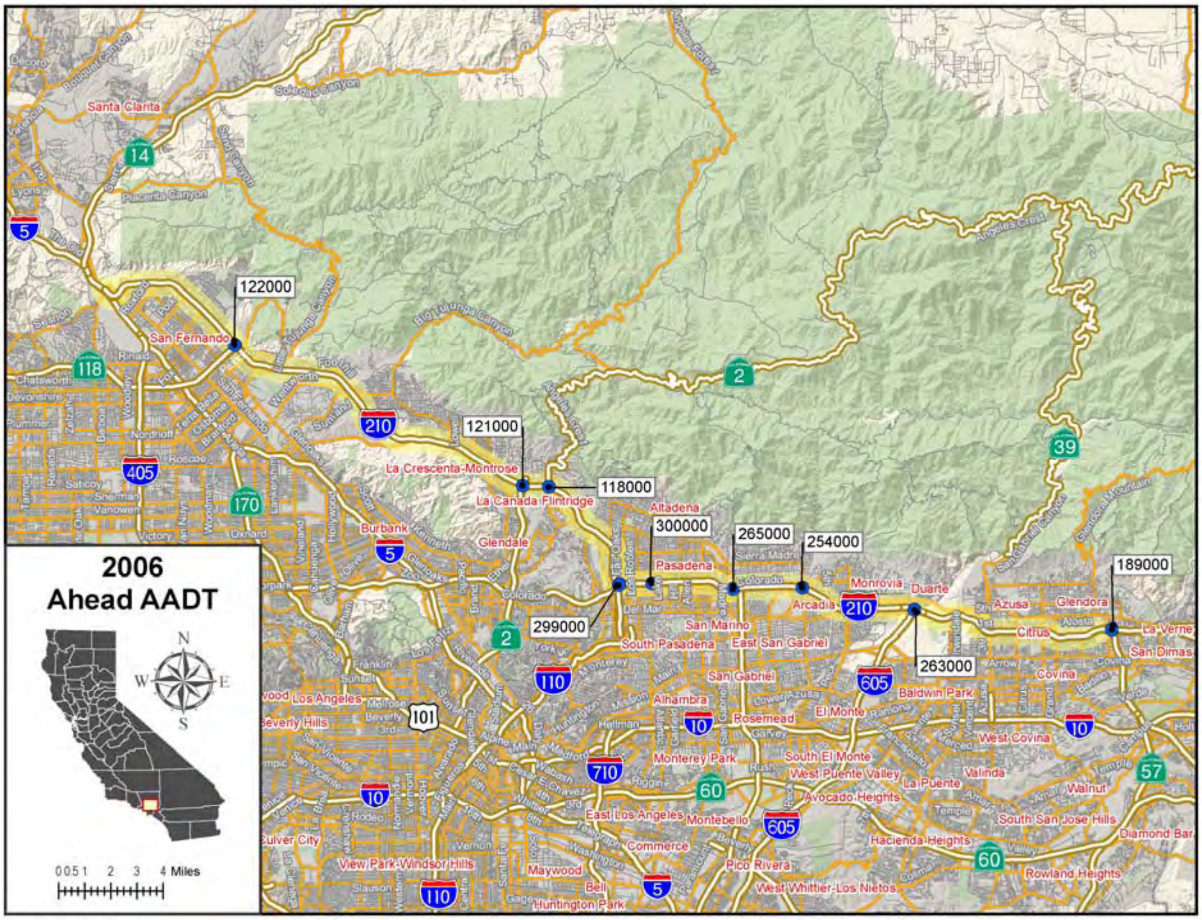
The I-210 study corridor is a divided eight to ten-lane freeway with a concrete median and an additional outside auxiliary lane at various sections throughout most of the corridor. Single High Occupancy Vehicle (HOV) lane is also provided along the center in each direction through portions of the study corridor from the SR-134 interchange to the SR-57 interchange. Exhibit 2-1 illustrates the lane configurations along the I-210 corridor.

Exhibit 2-1: I-210 Corridor Lane Configuration



The 2006 Caltrans Traffic and Volume Data Systems indicate that the annual average daily traffic (AADT) ranges from 81,000 to 301,000 vehicles per day, as illustrated in Exhibit 2-2. As illustrated in Exhibit 2-3, the I-210 corridor is a part of the STAA National Truck Network. According to the 2005 Annual Average Daily Truck Traffic on the California State Highway System published by Caltrans in November 2006, this corridor's daily truck traffic ranges from 4.00 percent to 8.43 percent of the total daily traffic.

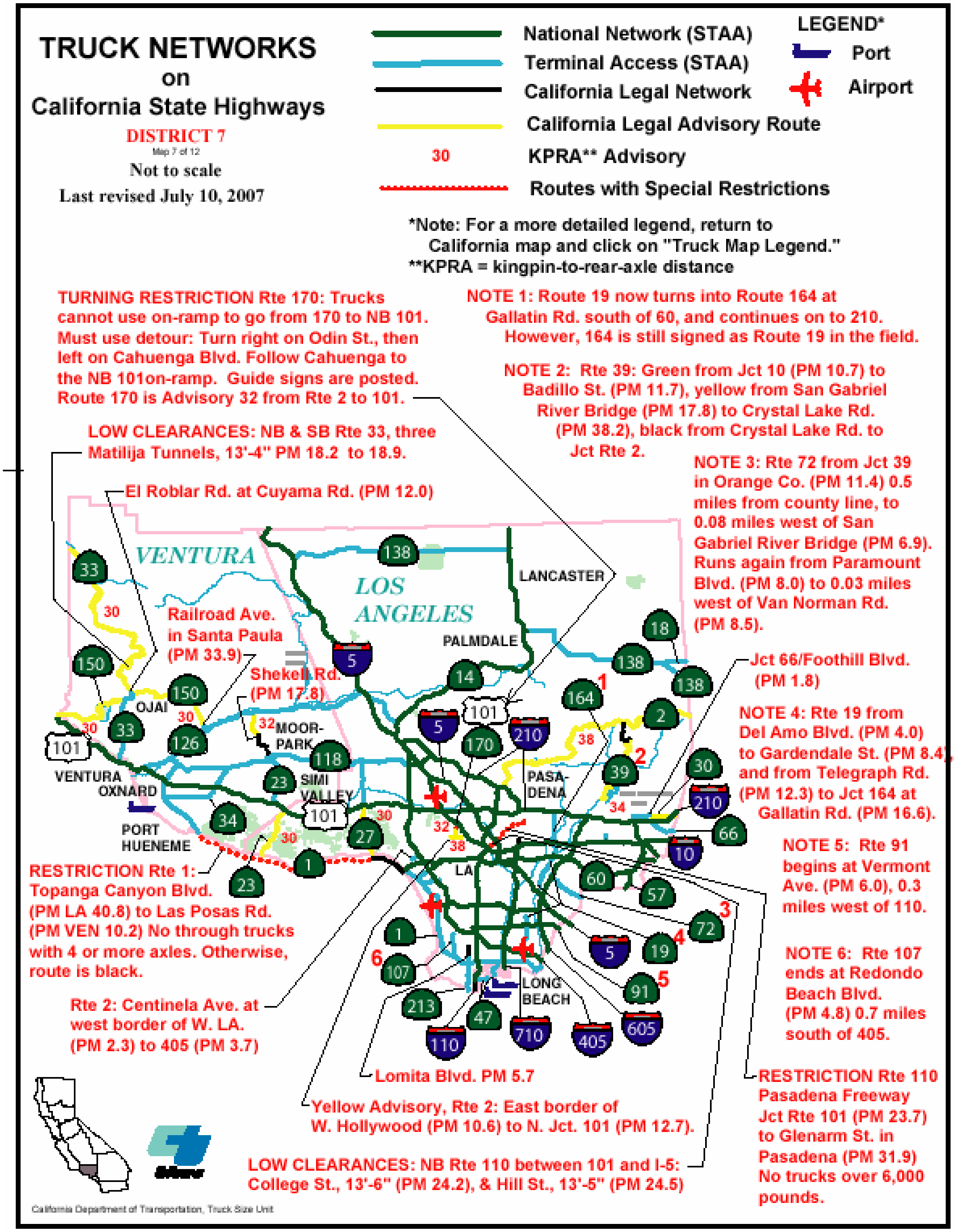
Exhibit 2-2: Major Interchanges and AADT along the I-210 Corridor



Source: AADT is from the Caltrans Traffic and Vehicle Data Systems Unit[1]

[1] http://www.dot.ca.gov/hq/traffops/saferesr/trafdata/

Exhibit 2-3: Los Angeles & Ventura County Truck Networks



Recent and Planned Roadway Improvements

Several roadway improvements have recently been completed and are currently under construction along the corridor. In preparation of System-Wide Adaptive Ramp Metering (SWARM) implementation, various on-ramps between SR-134 and SR-57 have been modified to either remove or implement metering with traffic signals on the HOV bypass lanes. Also, freeway-to-freeway connector on-ramps from I-605 and SR-57 have been modified to implement connector metering with traffic signals. In addition, additional closed-circuit television (CCTV) cameras and fiber optic communications are being implemented along the corridor.

Transit

Major transit operators within the I-210 corridor include Los Angeles County Metropolitan Transportation Authority (Metro), Metrolink commuter rail service, Foothill Transit, Los Angeles City Department of Transportation Commuter Express, and Pasadena Area Rapid Transit System (ARTS).

Metro services 1,433 square miles in Los Angeles County with over 190 bus lines and an average weekday passenger boarding of 1,200,000. It operates bus, bus rapid, and rail service along and parallel to the I-210 corridor. Within the proximity of the corridor, Metro operates Line 236 which runs along the corridor from the I-5 interchange to a parallel route along Glenoaks Boulevard and Hubbard Street to the San Fernando Metrolink Station. Line 224 operates from the Los Angeles County Olive View-UCLA Medical Center just north of I-210 and runs parallel to the corridor along San Fernando Road. Lines 90 and 91 provide parallel service along the I-210 corridor from Sunland to downtown Los Angeles. Line 292 services the Glenoaks Boulevard corridor parallel to the I-210 corridor. Line 290 runs along the corridor and Foothill Boulevard in Sunland. Line 267 operates from La Canada Flintridge to Pasadena along Lincoln Avenue and Del Mar Boulevard and Line 394 operates along San Fernando Road, which is parallel to the I-210 corridor. Within the study corridor, Lines 177 and 181 also operate on parallel local routes in the Cities of Pasadena and Arcadia. In addition to these bus lines, Metro also operates Metro Rapid 780 along Colorado Boulevard terminating at the Hill Street station. Metro Rail Gold Line also provides light-rail service from downtown Los Angeles Union Station to the Sierra Madre Villa station. This service runs along the center median of the I-210 freeway and terminates at the Sierra Madre Villa station.

Foothill Transit provides many bus lines servicing 327 square miles of the San Gabriel and Pomona Valley area. It has a weekday ridership of more than 48,000 with an annual ridership of approximately 15 million. Along the I-210 corridor, some of the major Foothill Transit lines include the following: Line 690, which runs on the I-210 corridor from Pasadena to pass the SR-57 interchange; Line 187 provides parallel service along Colorado Boulevard; Line 184 runs along both northerly and southerly of the corridor and provides service from the City of Arcadia to the City of Duarte; Line 492 provides parallel service along Live Oak Avenue and Arrow Highway, south of the I-210 corridor.

The City of Los Angeles Department of Transportation also operates two Commuter Service lines that service the San Gabriel Valley. Line 549 runs on the SR-134 (Ventura Freeway) from the Encino and North Hollywood area to the Pasadena area, and Line 409 connects downtown Los Angeles to the Glendale/Montrose area within the vicinity of the study corridor.

Other transit agencies such as the Pasadena Rapid Transit System and the Glendale Bee also operate local bus service that provides transportation between residential neighborhoods and business centers.

Exhibit 2-4 provides a Metro map of the transit lines servicing the various routes along the I-210 corridor.

The Metrolink Antelope Valley Line provides commuter rail service from the Antelope Valley along the I-5 and San Fernando Road to downtown Los Angeles. It runs parallel to the I-210 corridor from the I-5 and continues in a southwesterly direction to downtown Los Angeles. Exhibit 2-5 provides the system-wide Metrolink map servicing the Southern California region.

Exhibit 2-4: Metro Area Transit Map Servicing Routes along I-210 Corridor

Exhibit 2-5: Metrolink Commuter Rail System Map

Special Event Facilities/Trip Generators

There are major institutions, centers, and facilities that may generate large number of trips along the I-210 corridor. Exhibit 2-6 provides a map of some of their locations.

There are fourteen colleges/universities near the I-210 corridor. Many of the smaller colleges offer either undergraduate and/or graduate programs with student enrollments of 2,000 or less. Larger colleges such as the California State Polytechnic University Pomona located south of the I-210, is a public university with an estimated enrollment of

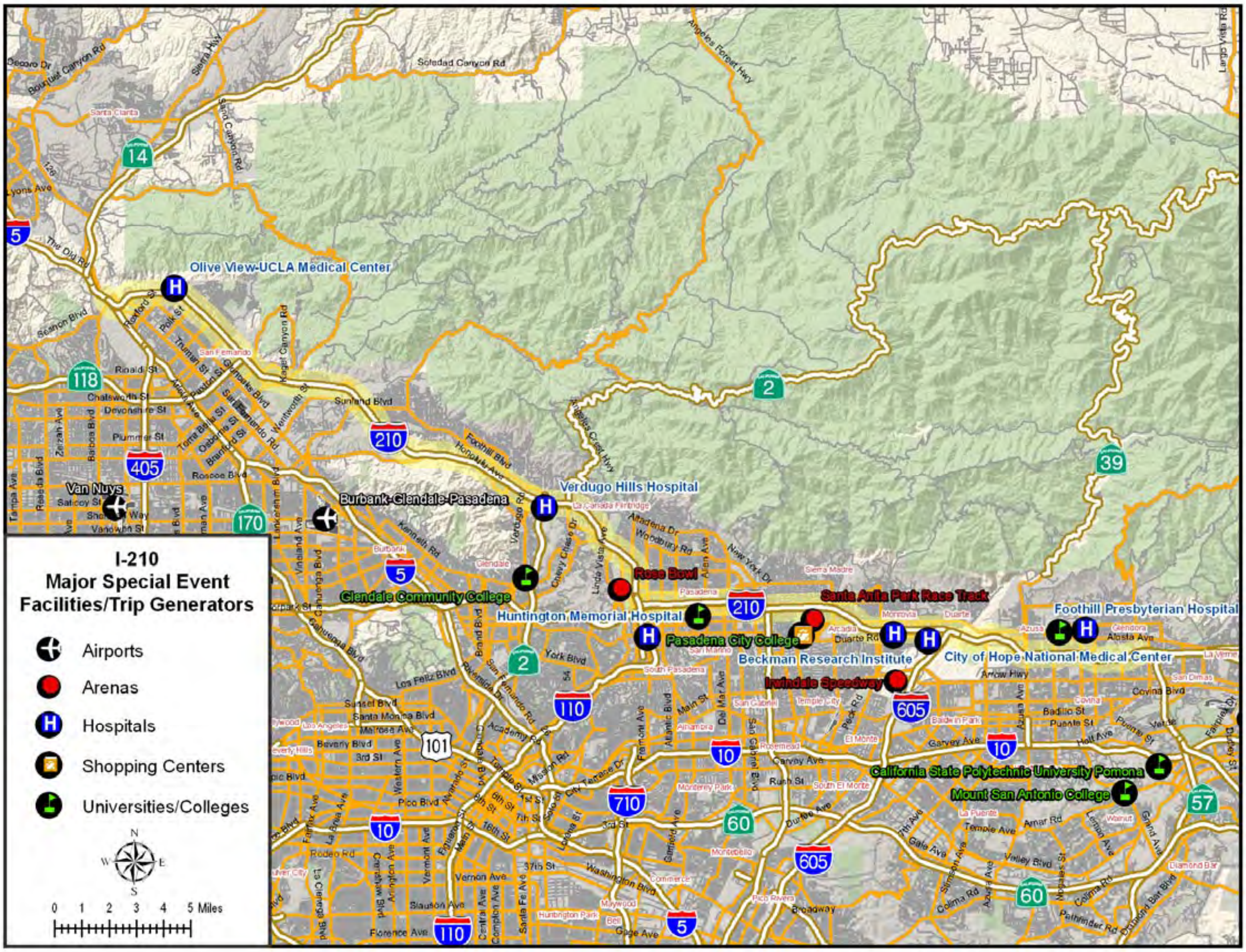
25,500 students. Mount San Antonio College is approximately five miles south of the I-210 in the City of Walnut. It is the largest public 2-year community college in the nation with an estimated enrollment of 42,000 students. Citrus College is located one mile north of the I-210 and is a public 2-year college with estimated enrollment of 12,000 students. Azusa Pacific University is located one mile south of the I-210 and is a private 4-year college with an estimated enrollment of 8,200 students offering Bachelors, Masters, and Doctorate Degrees. Pasadena City College is one mile south of the I-210 and is a public 2-year college with an estimated enrollment of 29,000 students. Glendale Community College is approximately five miles near the SR-2 freeway. It is a 2-year college with an estimated enrollment of 21,000 students. In addition to these educational facilities, Los Angeles County is comprised of many school districts serving cities throughout the I-210 corridor with traffic that could affect both corridors in the mornings and afternoons.

There are five major medical facilities within proximity of the corridor. Foothill Presbyterian Hospital is located one mile north of I-210 in the city of Glendora, west of the SR-57. It provides general acute care services, 24-hour emergency room services and medical/surgical services with 106 hospital beds. City of Hope National Medical Center is a non-profit organization and is a designated cancer center. City of Hope comprises an ambulatory and in-patient cancer treatment center as well as a biomedical research facility known as the Beckman Research Institute. It has 158 licensed hospital beds, 84 of which are devoted to bone marrow transplantation patients. Verdugo Hills Hospital, located south of the I-210 freeway near the junction of the Glendale Freeway, provides acute care facility with an emergency room and contains 158 beds. Olive View-UCLA Medical Center is located north of I-210 and three miles east of the I-5 Freeway. It is a teaching hospital affiliated with UCLA School of Medicine with 377 beds. St. Luke Medical Center is north of the I-210 in the city of Pasadena with an emergency room with 165 beds.

Another major special event facility is the Rose Bowl Stadium, which is located northwest of the I-210/SR-134 interchange. The stadium is the home of the Tournament of Roses Football Game, UCLA Bruin Football, Fourth of July celebrations, concerts, religious services, filming, and the World’s Largest Flea Market. It has a seating capacity of over 90,000 and its parking lots are available for a wide variety of rental uses.

Other major special event facilities include the Santa Anita Park Horse Track, Irwindale Speedway, and various large shopping malls. Other major traffic generators include the Bob Hope Airport in Burbank.

Exhibit 2-6: Major Special Event Facilities/Trip Generators



3. EXISTING CONDITIONS

This section summarizes the analysis results of the performance measures used to evaluate the existing conditions of the I-210 corridor. The primary objectives of the measures are to provide a sound technical basis for describing traffic performance on the corridor.

The performance measures focus on four key areas:

- **Mobility** describes how well the corridor moves people and freight
- **Reliability** captures the relative predictability of the public's travel time
- **Safety** captures the safety characteristics in the corridor such as collisions
- **Productivity** describes the productivity loss due to inefficiencies in the corridor

MOBILITY

Mobility describes how well the corridor moves people and freight. The mobility performance measures are both readily measurable and straightforward for documenting current conditions and are readily forecast making them useful for future comparisons. Two primary measures are typically used to quantify mobility: delay and travel time.

Delay

Delay is defined as the total observed travel time less the travel time under non-congested conditions, and is reported as vehicle-hours of delay. Delay is calculated by using the following formula:

$$(\text{Vehicles Affected per Hour}) \times (Dis\tan ce) \times (Duration) \times \left[\frac{1}{(\text{Congested Speed})} - \frac{1}{\text{35mph}} \right]$$

Where the vehicles affected depends on the methodology used. Some methods assume a fixed flow rate (e.g., 2,000 vehicles per hour per lane), while others use a measured or estimated flow rate. The distance is the length under which the congested speed prevails and the duration is the hours of congestion experience below the threshold speed.

The PeMS data source provides both recurrent and non-recurrent vehicle-hours of delay statistics at any time scale, and can inform this study about congestion characteristics by hour, time period, day of week, and month of year. For this study, the PeMS data contains separate data for HOV and mainline lanes.

Caltrans Highway Congestion Monitoring Program (HICOMP)

The HICOMP report has been published annually by Caltrans since 1987[2]. Delay is presented as average daily vehicle-hours of delay (DVHD) and attempts to represent the sum of all the delay experienced by commuters on the corridor.

For the HICOMP report, probe vehicle runs are performed at most only two to four days during the entire year. Ideally, two days of data collection in the spring and two in the fall of the year, but resource constraints may affect the number of runs performed during a given year. As will be discussed later in this section when discussing the PeMS data, congestion levels vary from day to day and depend on any number of factors including accidents, weather, and special events.

Exhibits 3-1 shows the yearly delay trends from 2004 to 2006 for the AM and PM peak travel period for both directions along the I-210 corridor. As indicated, the westbound direction had the most significant congestion during the AM peak period while the eastbound direction experienced the most congestion during the PM peak period. There was a small amount of congestion in the eastbound direction during the AM peak period in 2006; however, during the PM peak period, the westbound direction congestion was insignificant in 2005 and 2006.

Exhibit 3-1: Average Daily Vehicle-Hours of Delay

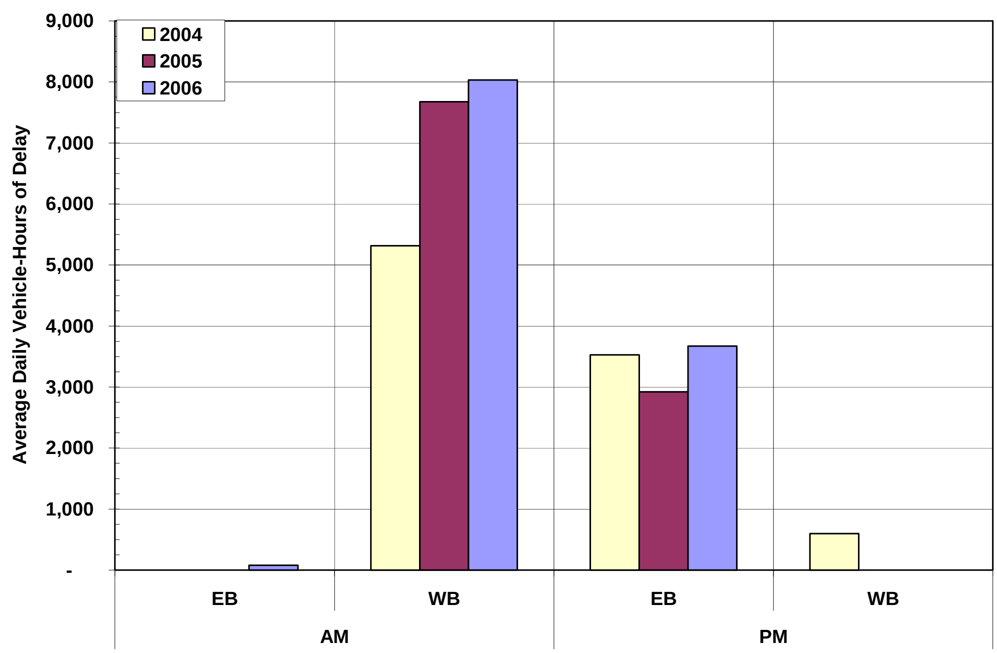


Exhibit 3-2 shows the complete list of congested segments reported by the HICOMP report for the I-210 corridor. Exhibits 3-3 and 3-4 provide maps illustrating the 2006

[2] Located at: http://www.dot.ca.gov/hq/traffops/sysmgtpl/HICOMP/index.htm

congested segments during the AM and PM peak commute periods for the I-210. The approximate locations of the congested segments, the duration of that congestion, and the reported recurrent daily delay are also shown.

More "generalized" congested segments were presented so that segment comparisons can be made from one year to the next since a given congested segment may vary in distance or size from one year to the next as well as from day-to-day.

The most congested segment on the corridor in 2006 was in the westbound direction in the AM peak period between Lone Hill Avenue and Azusa Avenue, where delay experienced in this segment totaled over 3,100 vehicle-hours.

Exhibit 3-2: HICOMP Congested Segments 2004-2006

Period	Dir	Generalized Congested Area	Generalized Area Congested Hours of Delay 2004	2005	2006
AM	EB	Lincoln Bl to Fair Oaks Ave			78
	WB	Fruit St to Lone Hill Ave		177	
		East of SR-57 to Irwindale Ave	2,515		
		Lone Hill Ave to Azusa Ave		2,155	3,143
		Irwindale Ave to Mountain Ave		3,951	2,007
		Irwindale Ave to Rosemead Bl	2,676		
		Mountain Ave (Monrovia) to Rosemead Bl			2,015
		Mountain Ave (Monrovia) to Lake Ave		1,395	
		Rosemead Bl to Lake Ave	125		
		Foothill Bl to west of Lake Ave			866
AM PEAK PERIOD SUMMARY			5,316	7,678	8,109
PM	EB	SR-134 to Baldwin Ave		743	
		West of Lake Ave to Sierra Madre Bl			431
		Hill Ave to Citrus Ave	3,529		
		Sierra Madre Bl to Mountain Ave (Monrovia)			2,771
		Baldwin Ave to I-605		1,849	
		Irwindale Ave to Citrus Ave		328	469
	WB	Buena Vista St to Rosemead Bl	600		
PM PEAK PERIOD SUMMARY			4,129	2,920	3,671
TOTAL CORRIDOR CONGESTION			**9,444**	**10,598**	**11,780**

Exhibit 3-3: 2006 AM Peak Period HICOMP Congested Segments Map

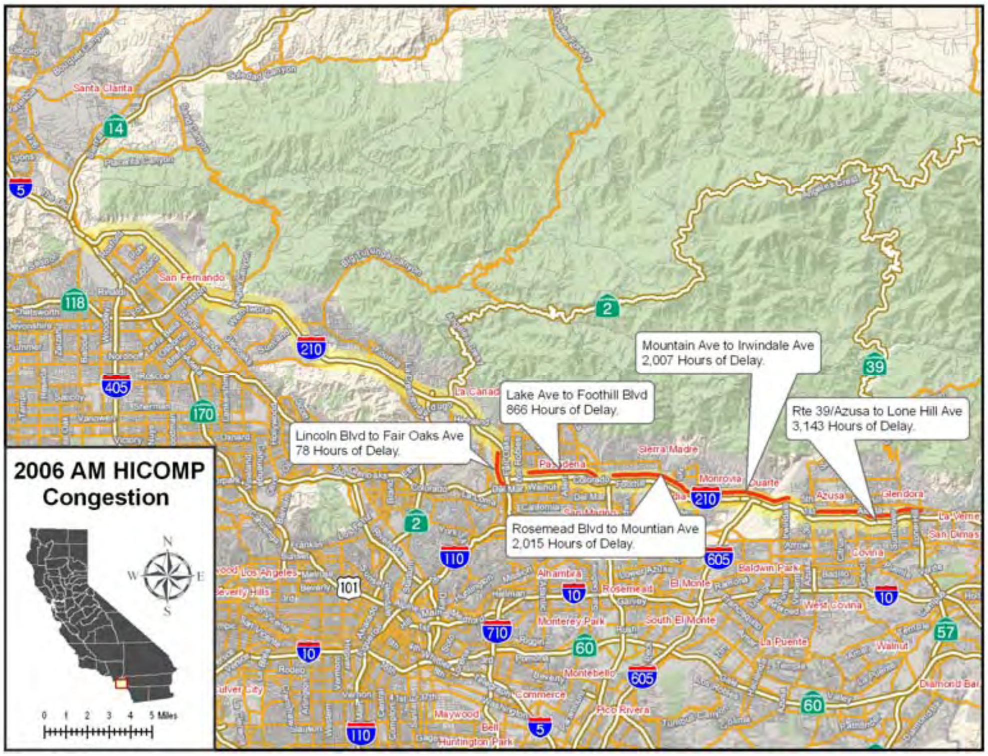
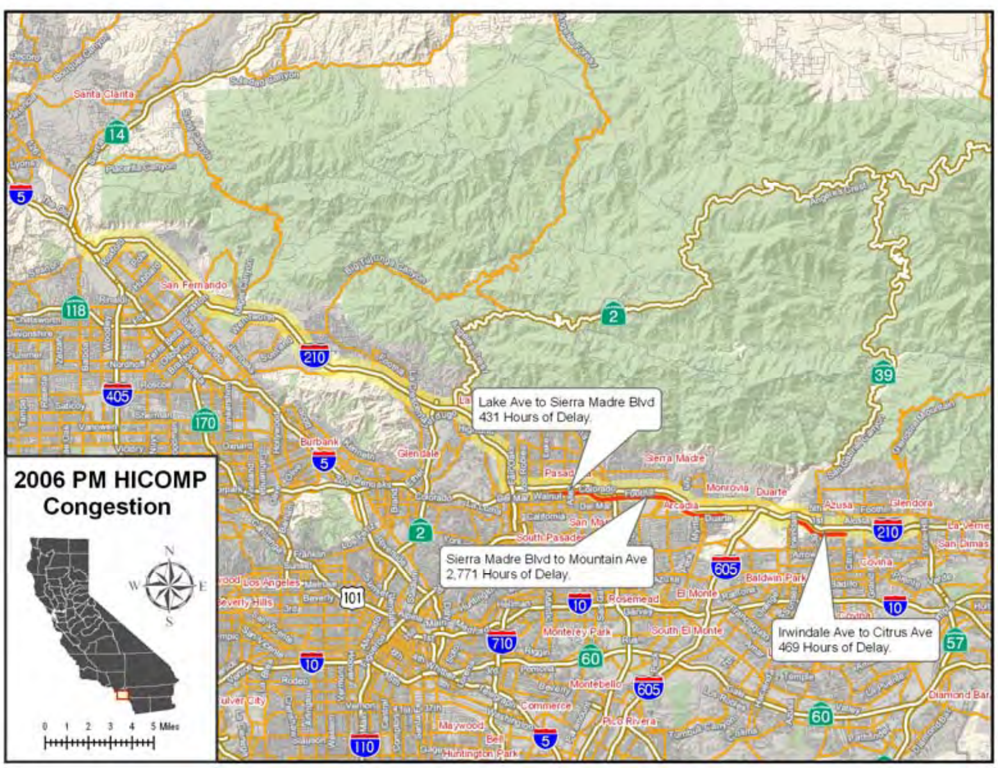


Exhibit 3-4: 2006 PM Peak Period HICOMP Congested Segments Map



<u>Freeway Performance Measurement System (PeMS)</u>

Exhibit 3-5 is a graphic from PeMS showing the I-210 corridor vehicle detection stations (VDS) and the “good” (green) and “bad” (red) VDS data available for February 22, 2007. As illustrated in the exhibit, the detection for the I-210 corridor is mostly good. As also indicated no VDS currently exist north of SR-2. As such, data analysis cannot be done for this northern section of the corridor with the existing data. However, there is currently and historically little or no congestion along this section of the corridor. Therefore, the focus of the performance assessment is between the SR-134 (postmile R22) and SR-57 (postmile R45) interchanges. Exhibits 3-8 and 3-9 are charts indicating the percentage of “good” (observed) data for I-210 for each month between 2004 and 2006.

Exhibit 3-6 shows that data quality for working sensors varies by month throughout the study corridor section. The westbound detection is generally better than for the eastbound detection throughout the three-year period. As indicated, detection for the westbound direction reaches approximately 80 percent, while for the eastbound direction, approximately 75 percent. While not perfect, the data quality was sufficient for the analysis to produce reasonably accurate results.

Exhibit 3-5: PeMS Sensor Data Quality February 22, 2007

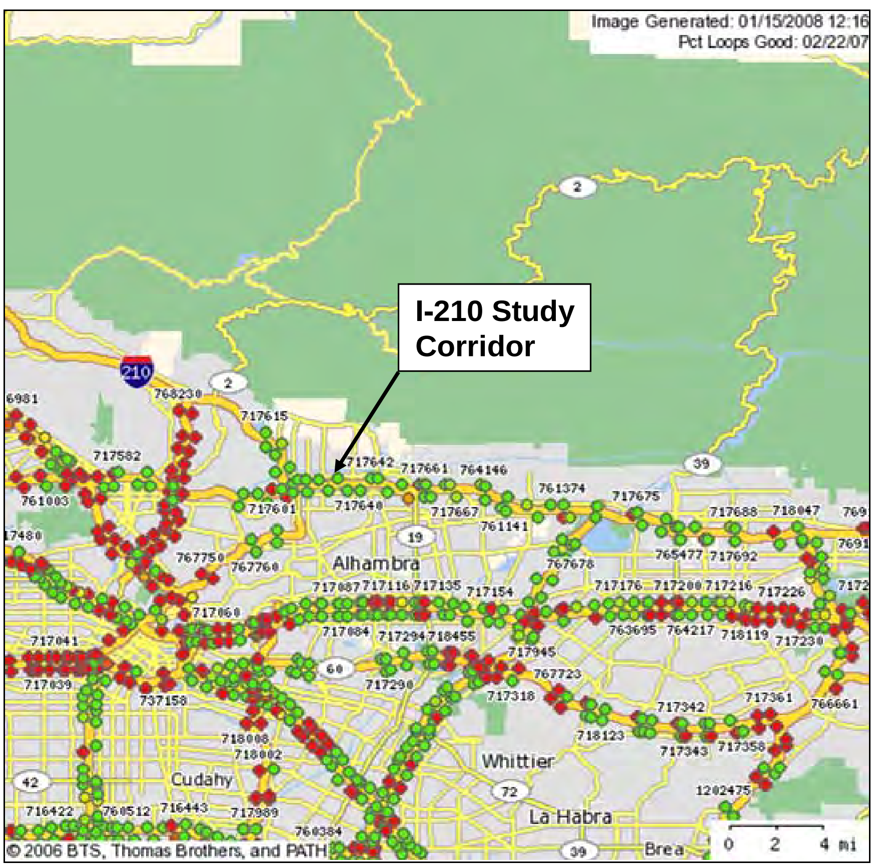
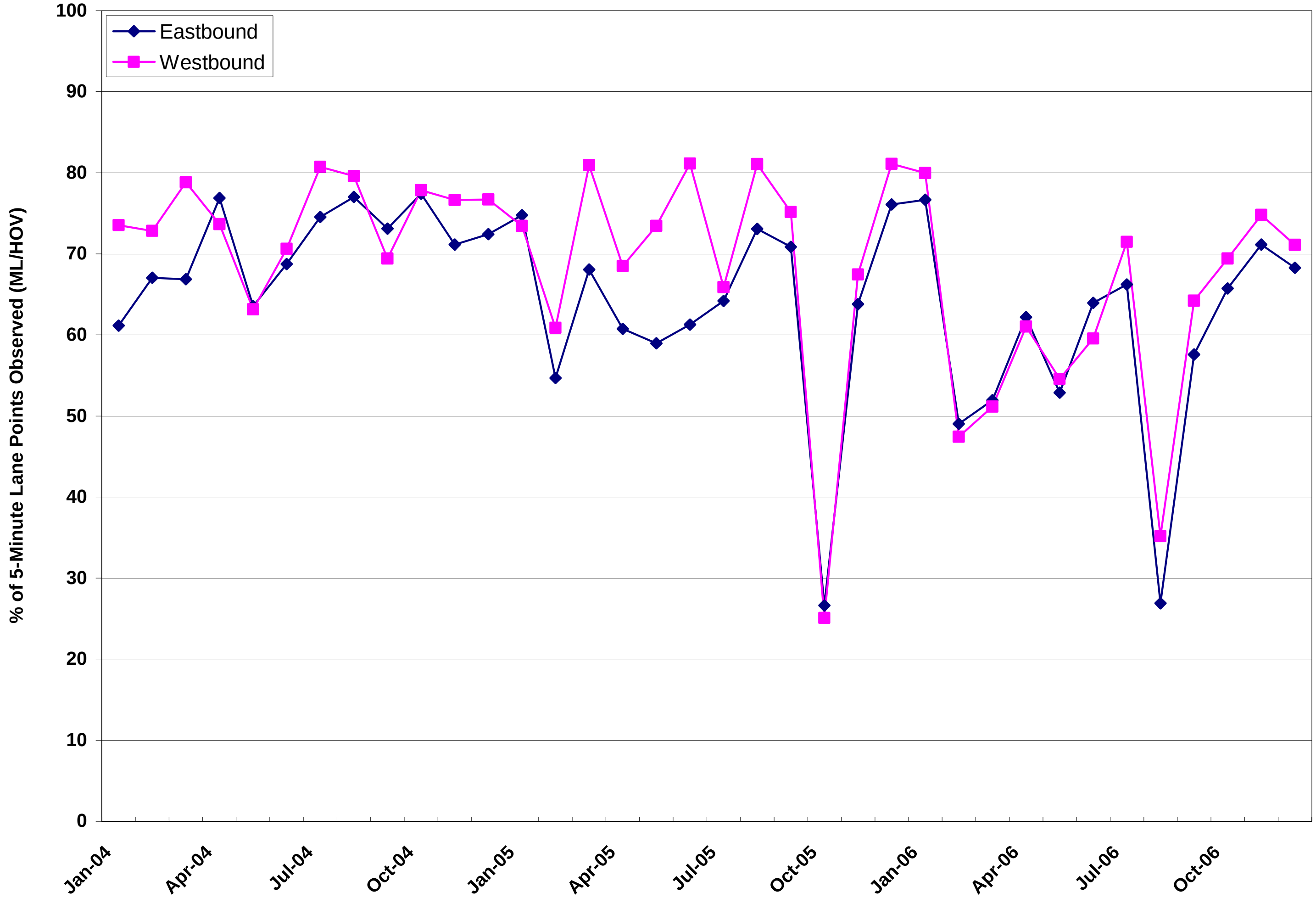


Exhibit 3-6: I-210 (SR-134 to SR-57) PeMS Sensor Data Quality 2004-2006



The study compiled three years of PeMS data, 2004 to 2006, and filtered out data that was considered to be of insufficient quality (i.e., less than 75 percent observed). Unlike HICOMP where delay is only considered and captured for speeds below 35 miles per hour and applied to an assumed output or capacity volume of 2000 vehicles per hour, delays presented hereon using PeMS represent the difference in travel time between “actual” conditions and free flow conditions at 60 miles per hour, applied to the actual output flow volume collected from a vehicle detector station. The total delay by time period for the corridor for each direction is shown in Exhibits 3-7 and 3-8.

Total delay along the I-210 study corridor was computed for four time periods: AM peak (6:00 AM to 9:00 AM), Midday (9:00 AM to 3:00 PM), PM peak (3:00 PM to 7:00 PM), and evening/early AM (7:00 PM to 6:00 AM). Delay is computed as the difference in estimated travel time and a hypothetical travel time at a threshold speed of 60 miles per hour. This is different from the State of the System/HICOMP reporting methodology, which calculates delay using the “severe” threshold speed of 35 mph.

Exhibits 3-7 and 3-8 show the three-year trend in overall weekday delay for the I-210 corridor for the three years analyzed for the eastbound and westbound directions, respectively. There is also a 90-day moving average to “smooth” out the day-to-day variations and better illustrate the seasonal and annual changes in congestion over time. As indicated in Exhibit 3-7, the eastbound PM peak period experiences the highest levels of congestion in the westbound direction. Exhibit 3-8 shows that the AM peak period experiences the highest levels of congestion. Eastbound PM peak period delay averages approximately 6,700 vehicle-hours while westbound AM peak period delay averages approximately 4,200 vehicle-hours.

Exhibit 3-7: I-210 Eastbound Average Daily Delay by Time Period 2004-2006

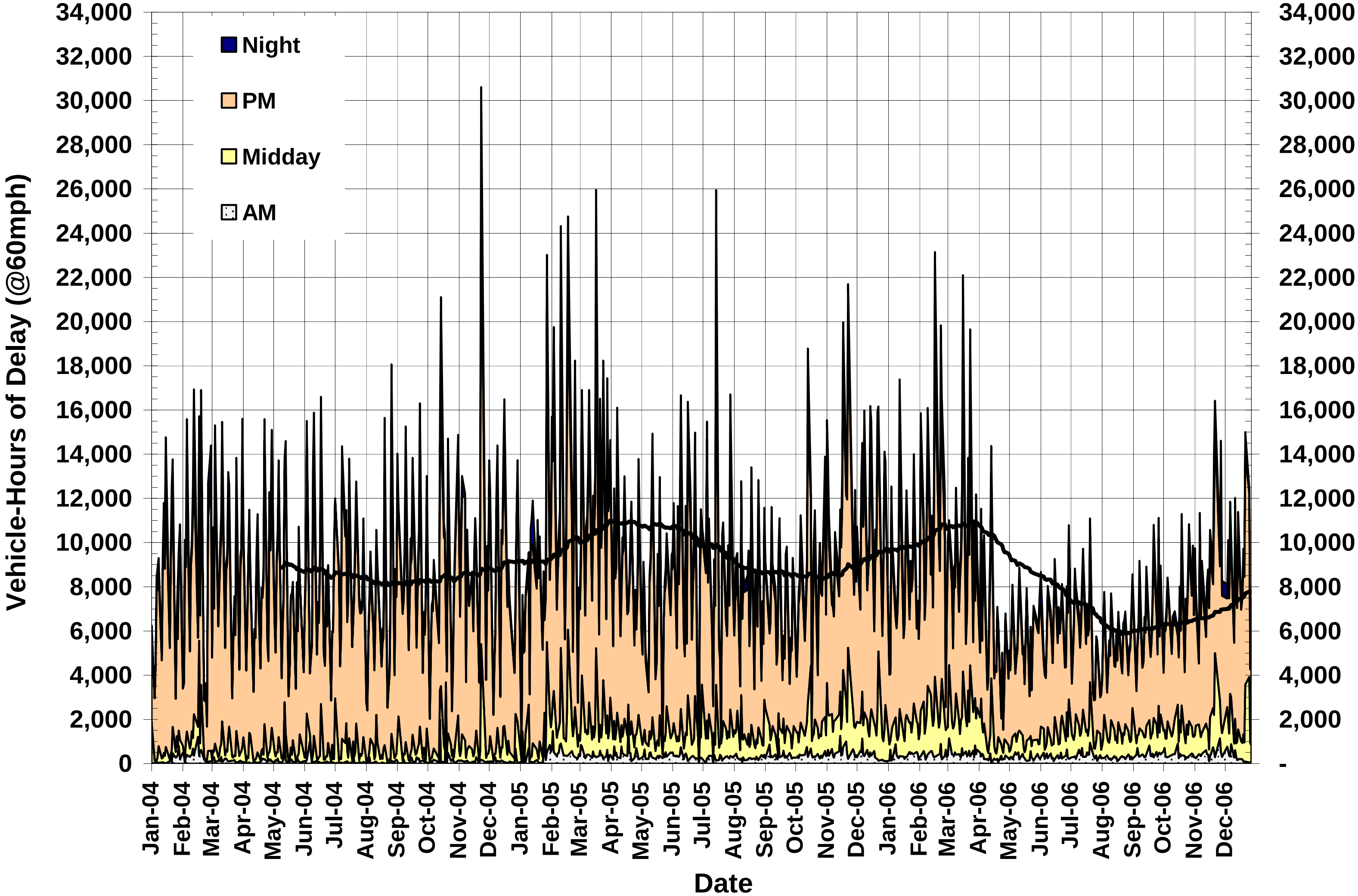
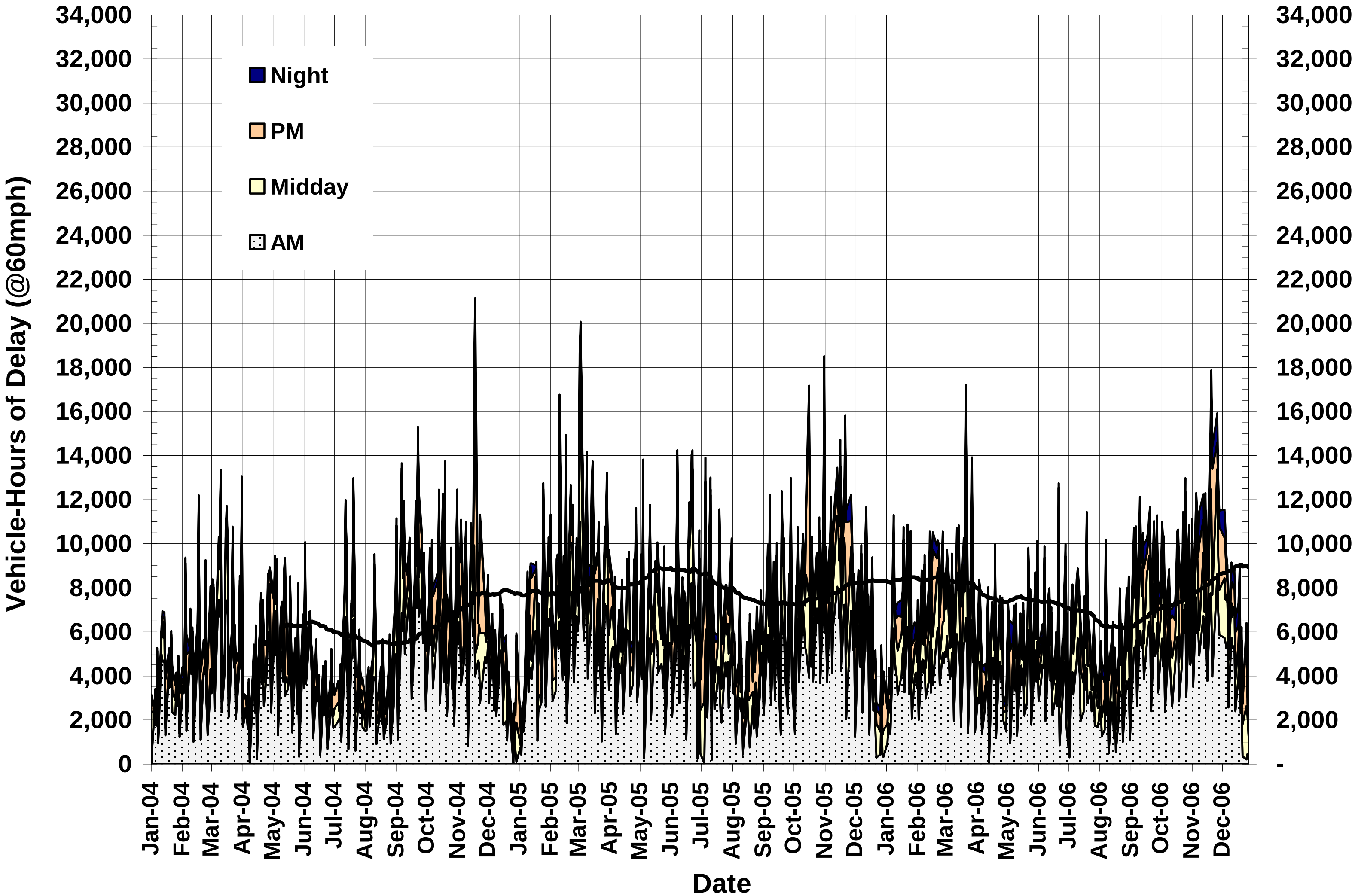
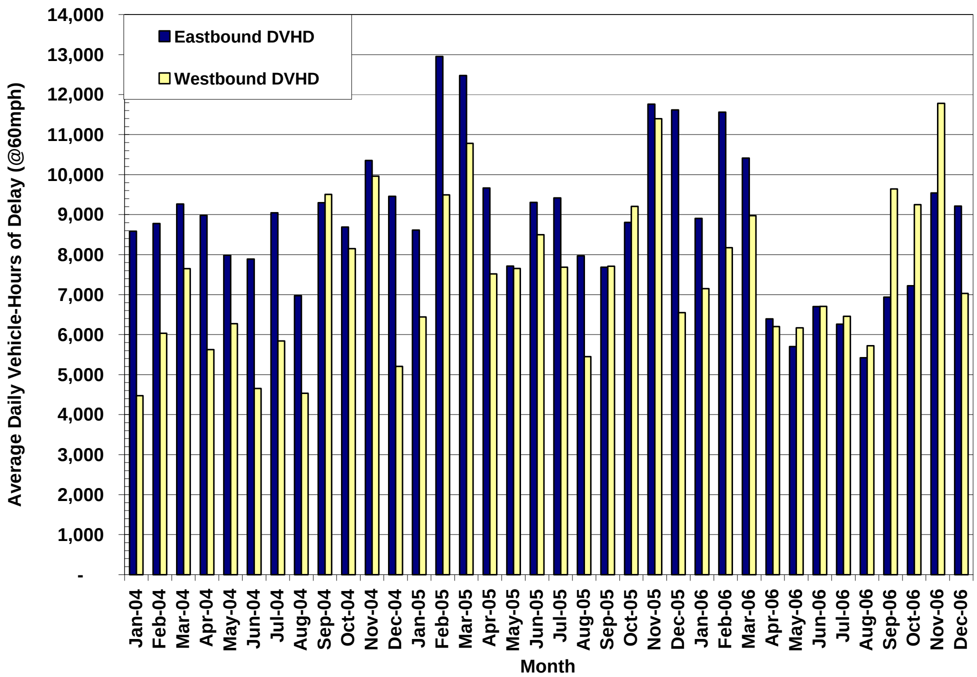


Exhibit 3-8: I-210 Westbound Average Daily Delay by Time Period 2004-2006



The next set of exhibits provides additional delay characteristics and trends. Exhibit 3-9 illustrates the average daily weekday delay by month for the respective directions. As indicated in this exhibit, the average weekday delay varies month to month, ranging from approximately 5,500 vehicle-hours to 13,000 vehicle-hours in the eastbound direction, and from approximately 4,500 vehicle-hours to 12,000 vehicle-hours in the westbound direction.

Exhibit 3-9: Average Weekday Delay by Month 2004-2006

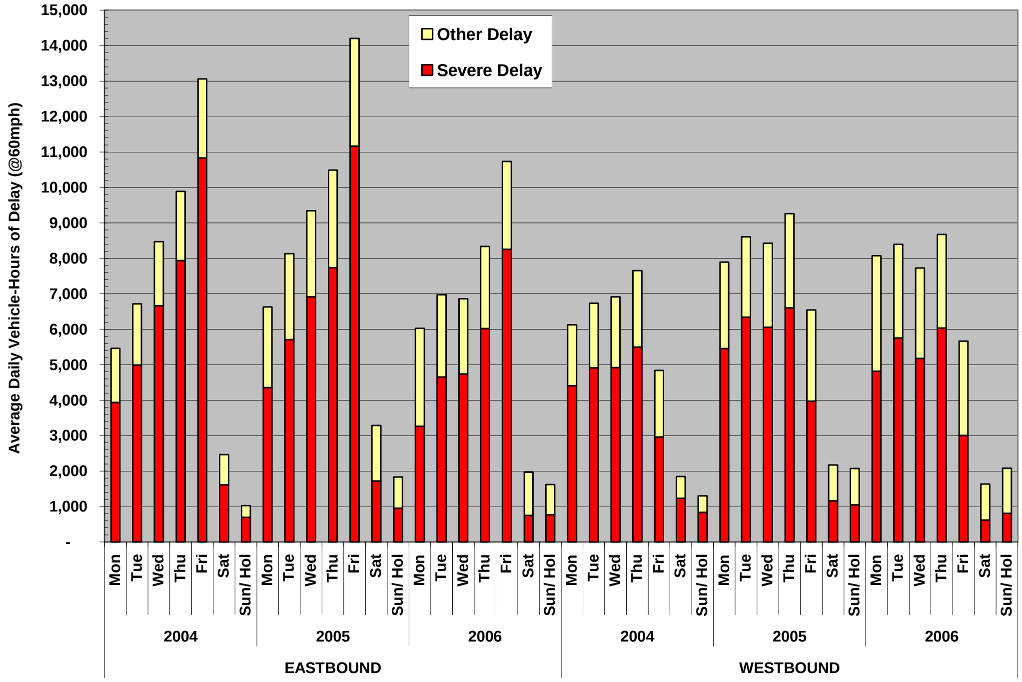


Delays presented to this point represent the difference in travel time between "actual" conditions and free flow conditions at 60 miles per hour. This delay can be segmented into two components as shown in Exhibits 3-10:

- Severe delay – delay that occurs when speeds are below 35 miles per hour; and
- Other delay – delay that occurs when speeds are between 35 miles per hour and 60 miles per hour.

Severe delay in Exhibit 3-10 represents breakdown conditions and is generally the focus of congestion mitigation strategies. On the other hand, "other" delay represents conditions approaching the breakdown congestion, leaving the breakdown conditions, or areas that do not cause widespread breakdowns, but cause at least temporary slowdowns. Although combating congestion requires the focus on severe congestion, it is important to review "other" congestion and understand its trends. This could allow for pro-active intervention before the "other" congestion turns into severe congestion. As indicated in Exhibit 3-10, the eastbound direction on Fridays experienced the highest "severe" delays of more than 11,000 vehicle-hours. In the westbound direction, "severe" delays did not change significantly from year to year, while "other" delays increased slightly from 2004 through 2006.

Exhibit 3-10: Average Delay by Day of Week by Severity 2004-2006



Another way to understand the characteristics of congestion and related delays is shown in Exhibits 3-11 and 3-12, which summarize average weekday hourly delay for the three years analyzed. Exhibit 3-11 shows the eastbound average weekday hourly delay from 2004 through 2006. Peak hourly delay ranges from 1,700 to 2,400 vehicle-hours with the congested occurring from approximately 2:30PM to 6:30PM. Exhibit 3-12 shows the westbound average weekday hourly delay from 2004 through 2006. Peak hourly delay ranges from 1,600 to 1,900 vehicle-hours with the congested period occurring from approximately 5:30AM to 9:30AM.

These exhibits show total delay by hour for the three years from 2004 through 2006 for the I-210 corridor. They are useful in that they show the peaking characteristics of congestion and how the peak period is changing over time.

Exhibit 3-11: Eastbound Average Weekday Hourly Delay 2004-2006

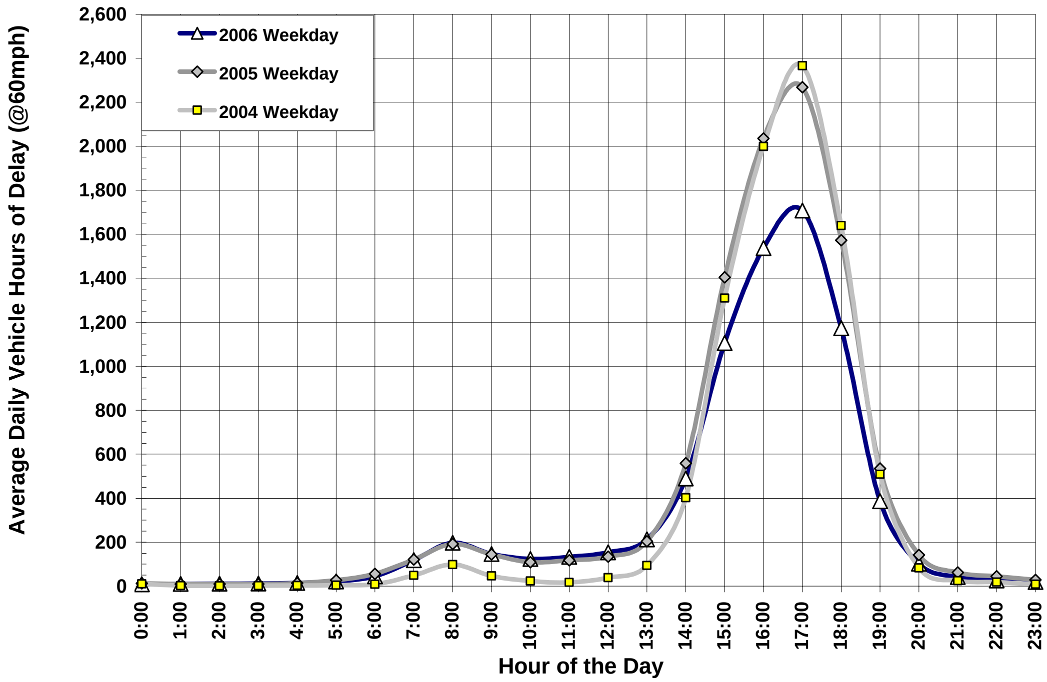
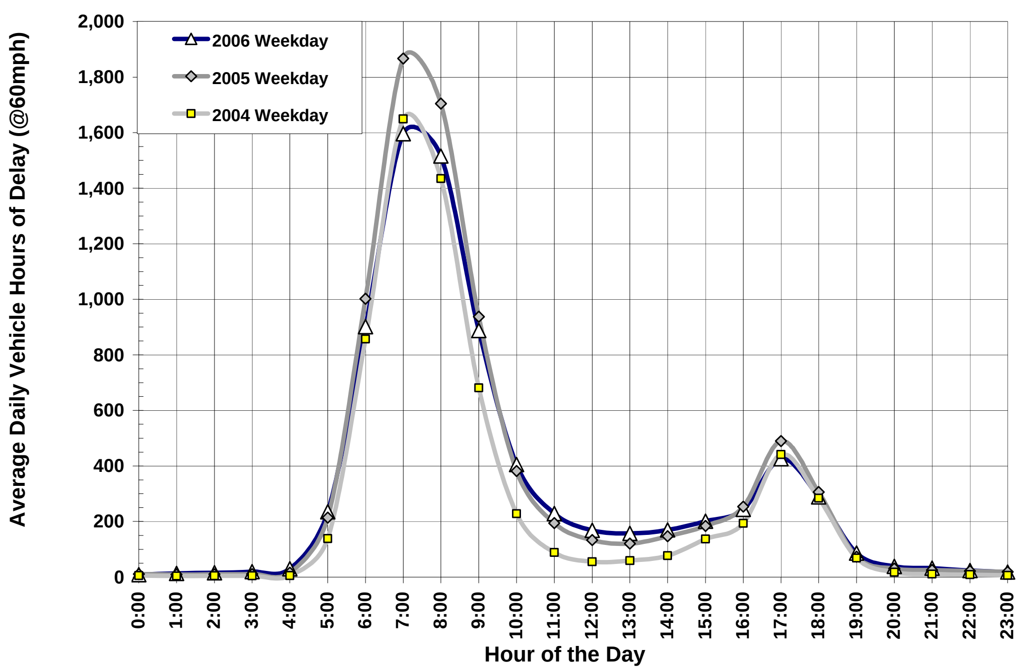


Exhibit 3-12: Westbound Average Weekday Hourly Delay 2004-2006



Travel Time

Travel time is reported as the amount of time for a vehicle to traverse between two points on a corridor. For the I-210 corridor, this travel time is the time to traverse the 23-mile I-210 corridor from west of SR-134 to east of SR-57. Travel time on parallel arterials was not included for this analysis. For this performance measure, PeMS was used to analyze travel time.

Exhibit 3-13 illustrates the travel times assessed for this I-210 corridor section. As indicated the eastbound section had typical travel time of approximately 46 minutes during the peak hour (4-5PM) and about 27 minutes during mid-day off-peak, whereas the westbound direction had typical travel time of approximately 38 to 43 minutes during the AM peak hour (7-8AM) and about 24 to 30 minutes during the mid-day and PM hours.

Exhibit 3-13: Eastbound Travel Time by Time of Day 2004-2006

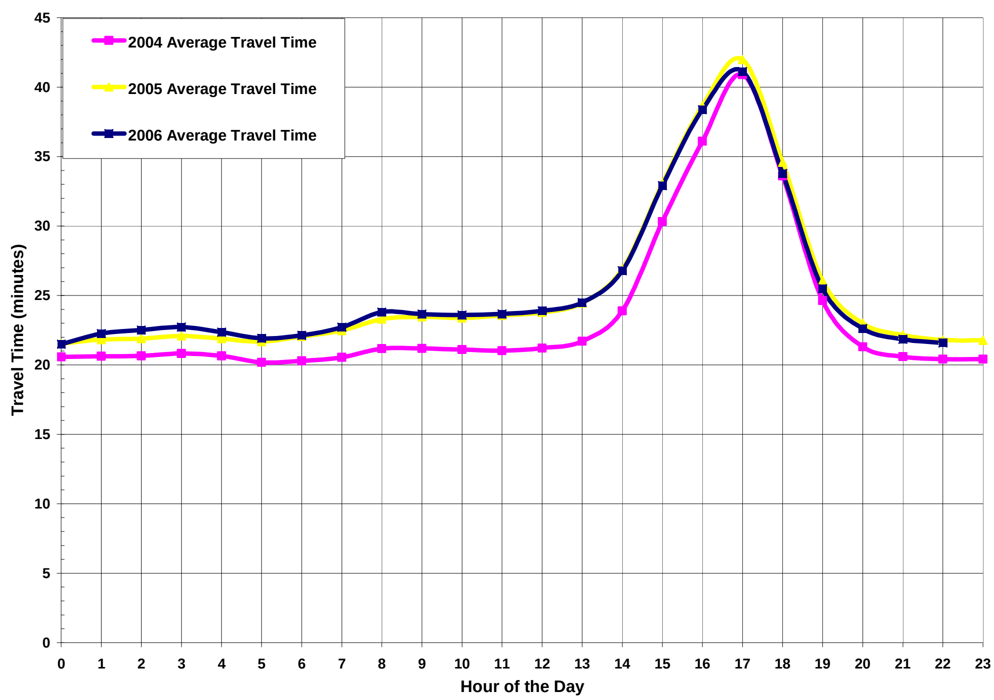
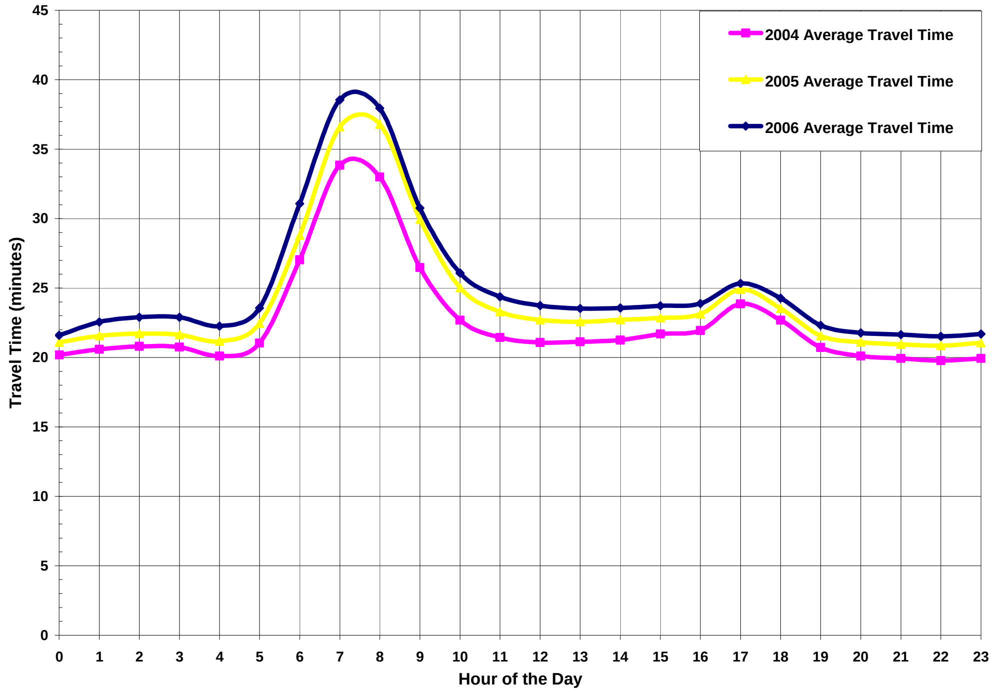


Exhibit 3-14: Westbound Travel Time by Time of Day 2004-2006



RELIABILITY

Reliability captures the relative predictability of the public's travel time. Unlike mobility, which measures how many people are moving at what rate, the reliability measure focuses on how much mobility varies from day to day.

PeMS was used to calculate travel time variability. Since there are PeMS sensors producing reasonable data at various points along the corridor – in both free-flow sections as well as severely congested sections – it is useful to use the PeMS sensors reporting observed data to estimate the reliability, or variability, in travel time.

Exhibits 3-15 to 3-20 illustrate the variability of travel time along I-210 from SR-134 to SR-57 for weekdays averaged throughout the indicated year. As evident in the exhibits, travel times can range as much as 200% or more of the mean travel time during the peak hours. Daily reliability will vary within this range (mean to maximum) depending on the number and extent of incidents occurring during travel. Travel times of less than the mean are infrequent, typically occurring during the day preceding or following a holiday weekend. In 2006, travel time reliability improved significantly from that of previous years, particularly during off-peak hours.

Exhibit 3-15: Eastbound Travel Time Variation Range 2004

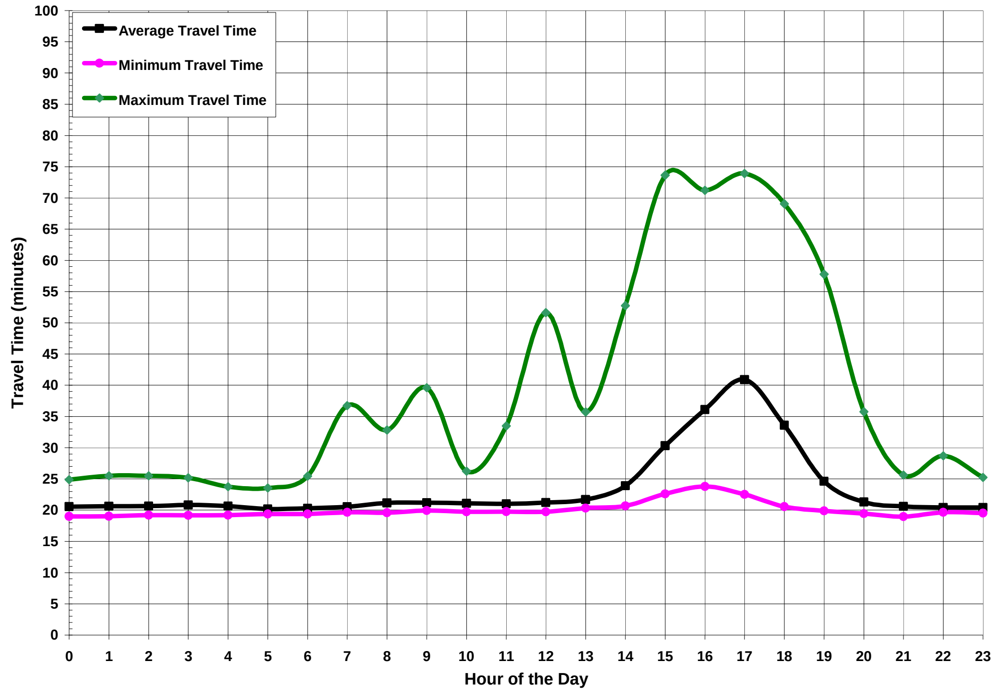


Exhibit 3-16: Westbound Travel Time Variation Range 2004

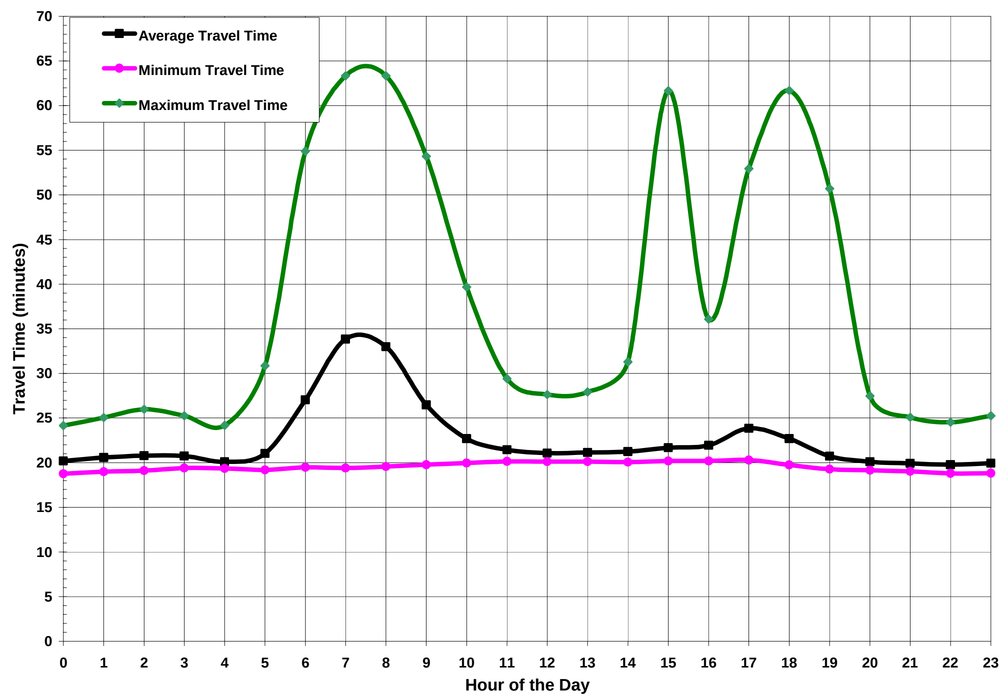


Exhibit 3-17: Eastbound Travel Time Variable Range 2005

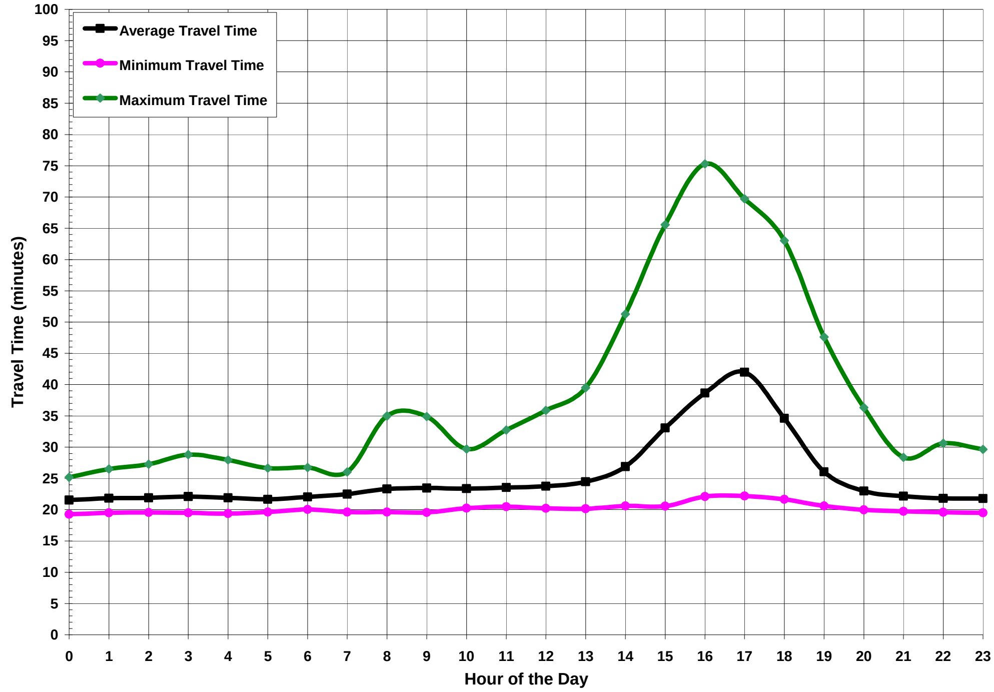


Exhibit 3-18: Westbound Travel Time Variable Range 2005

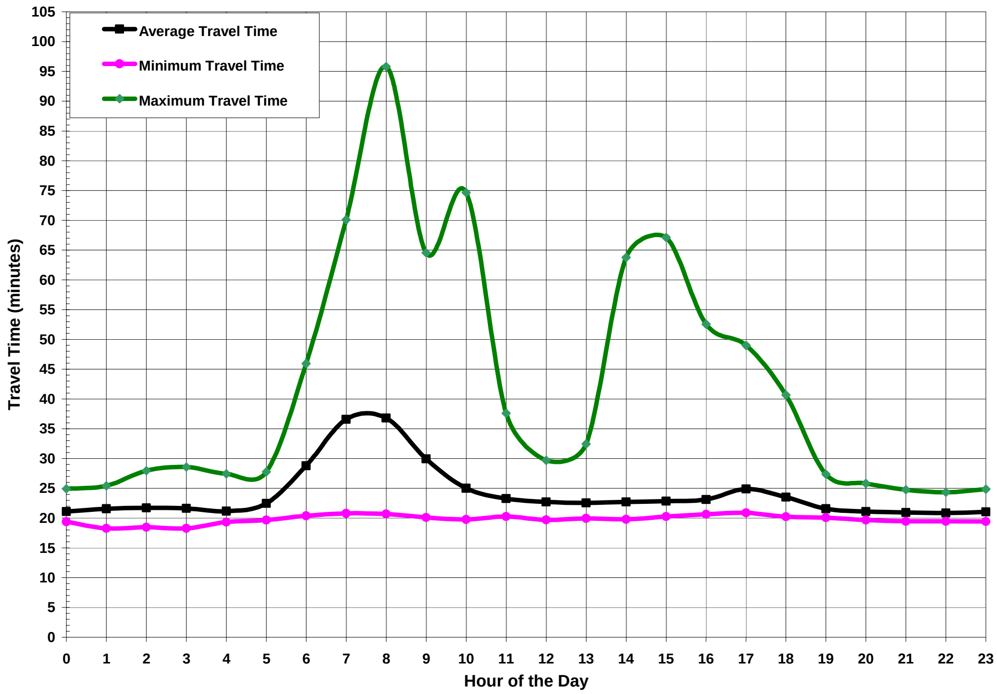


Exhibit 3-19: Eastbound Travel Time Variable Range 2006

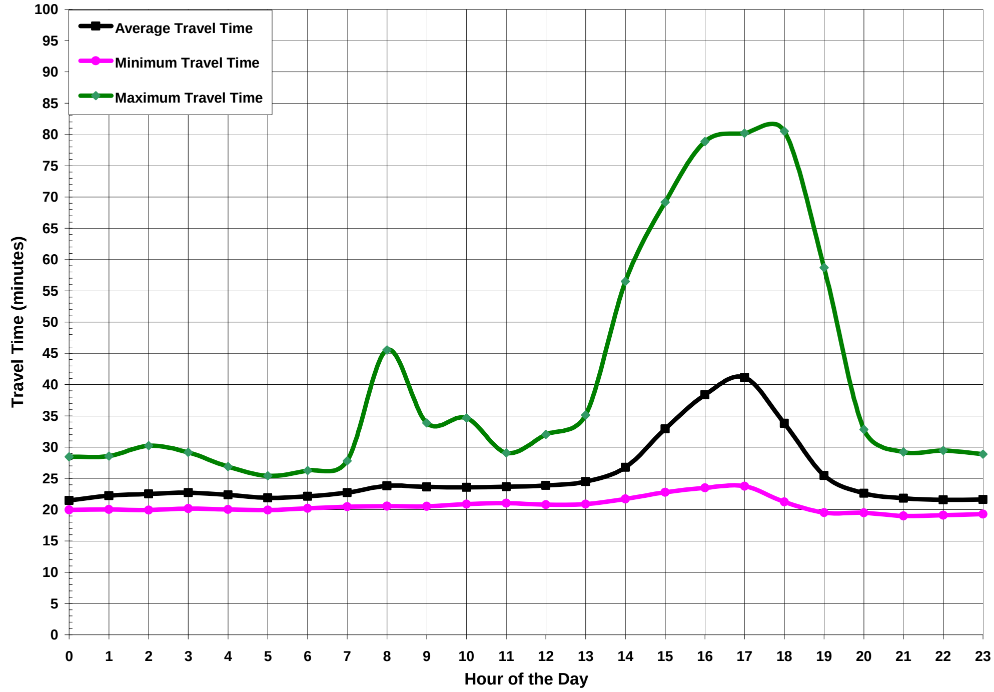
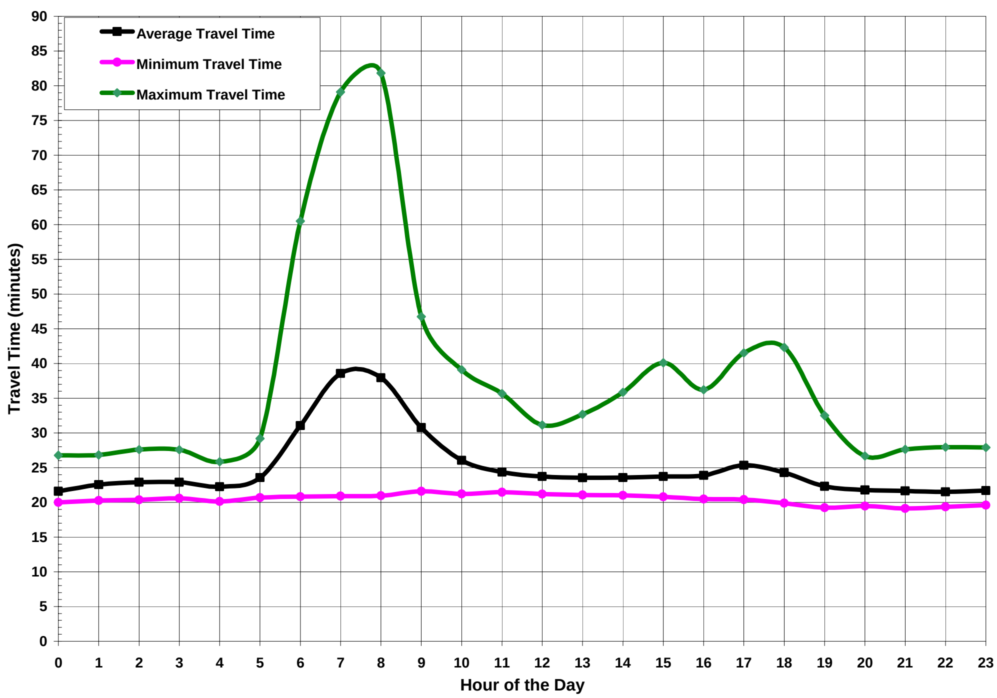


Exhibit 3-20: Westbound Travel Time Variable Range 2006



SAFETY

For the safety performance measure, the number of accidents and accident rates from the Caltrans Traffic Accident Surveillance and Analysis System (TASAS) were used. TASAS is a traffic records system containing an accident database linked to a highway database. The highway database contains description elements of highway segments, intersections and ramps, access control, traffic volumes and other data. TASAS contains specific data for accidents on State highways. Accidents on non-State highways are not included (e.g., local streets and roads).

The safety assessment in this report is intended to characterize the overall accident history and trends in the corridor, and to highlight notable accident concentration locations or patterns that are readily apparent. This report is not intended to supplant more detailed safety investigations routinely performed by Caltrans staff.

Exhibits 3-21 and 3-22 illustrate the I-210 eastbound and westbound accidents by month, respectively, for the western half of the corridor from I-5 junction (postmile 0) to SR-134 (postmile 22). Exhibits 3-23 and 3-24 illustrate the I-210 eastbound and westbound accidents by month, respectively, for the eastern half of the corridor from SR-134 (postmile R22) to SR-57 (postmile R45). Caltrans typically analyzes the latest three-year safety data. The latest available TASAS data from PeMS is to June 30, 2006; therefore, monthly data from July 1, 2003 through June 30, 2006 were analyzed and results presented.

As indicated, the eastbound and westbound had approximately equal number of accidents. However, the western half of the corridor, from I-5 to SR-134, experienced as many as 25 accidents per month per direction while the eastern half of the corridor, from SR-134 to SR-57, experienced as many as 80 accidents per month per direction.

Exhibit 3-21: Eastbound Monthly Accidents 2004-2006 (PM 0 to 22)

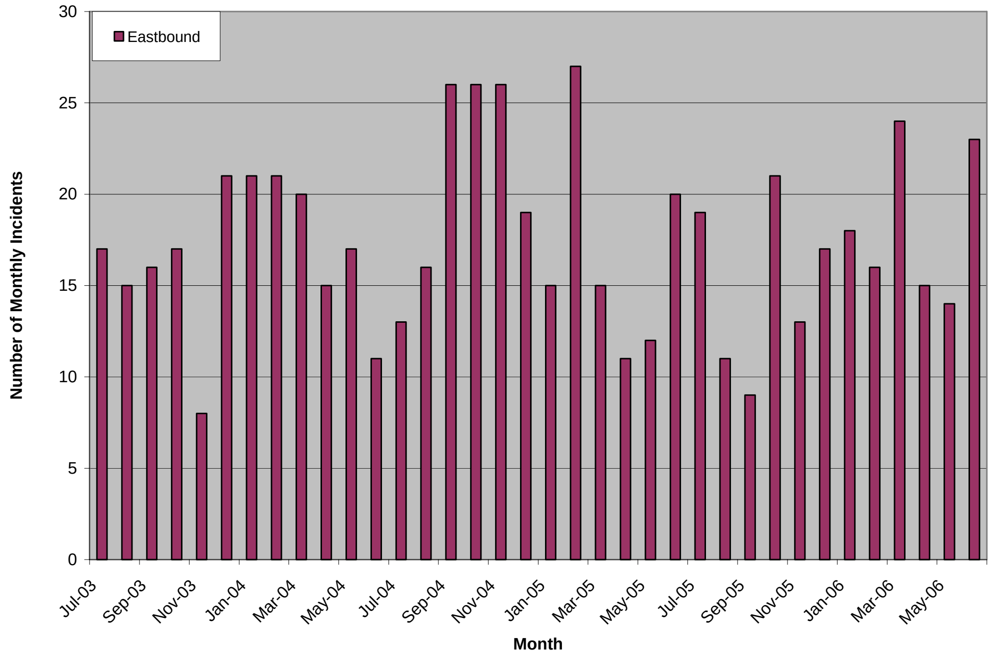


Exhibit 3-22: Westbound Monthly Accidents 2004-2006 (PM 0 to 22)

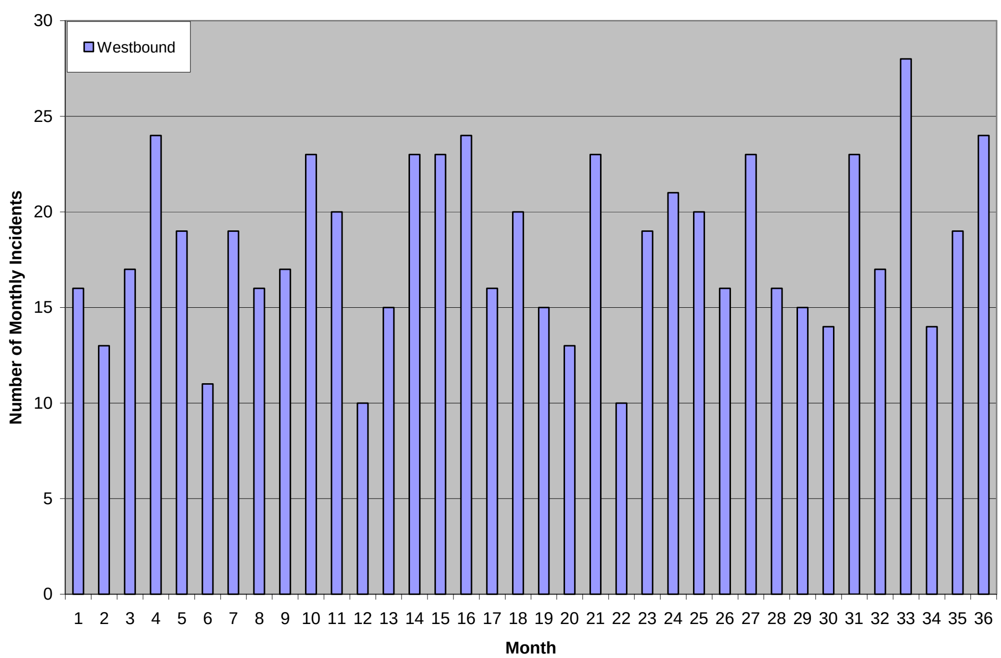


Exhibit 3-23: Eastbound Monthly Accidents 2004-2006 (PM 22 to 45)

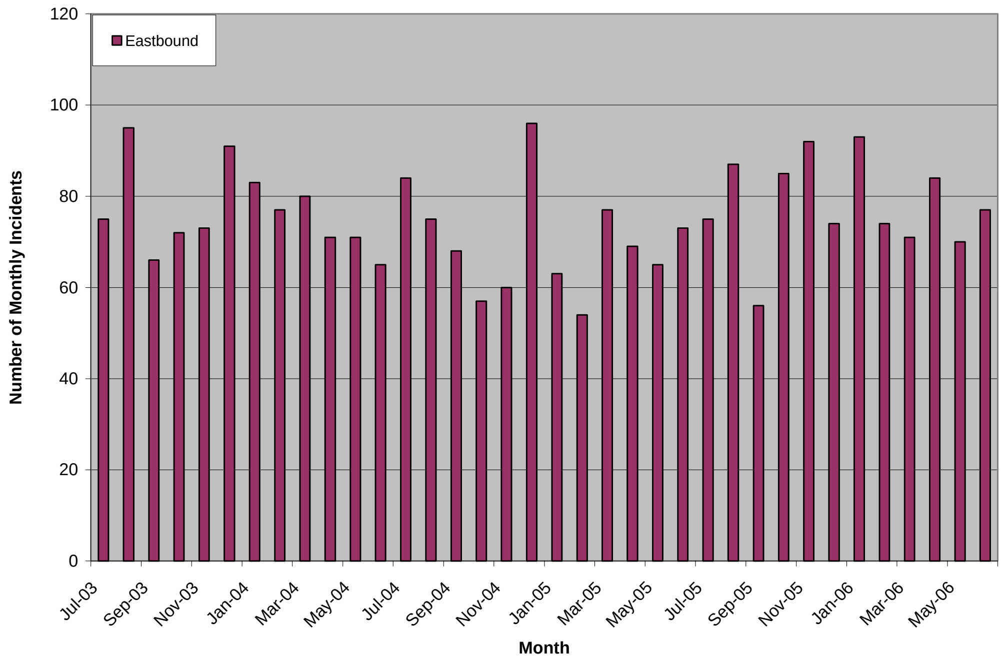


Exhibit 3-24: Westbound Monthly Accidents 2004-2006 (PM 22 to 45)

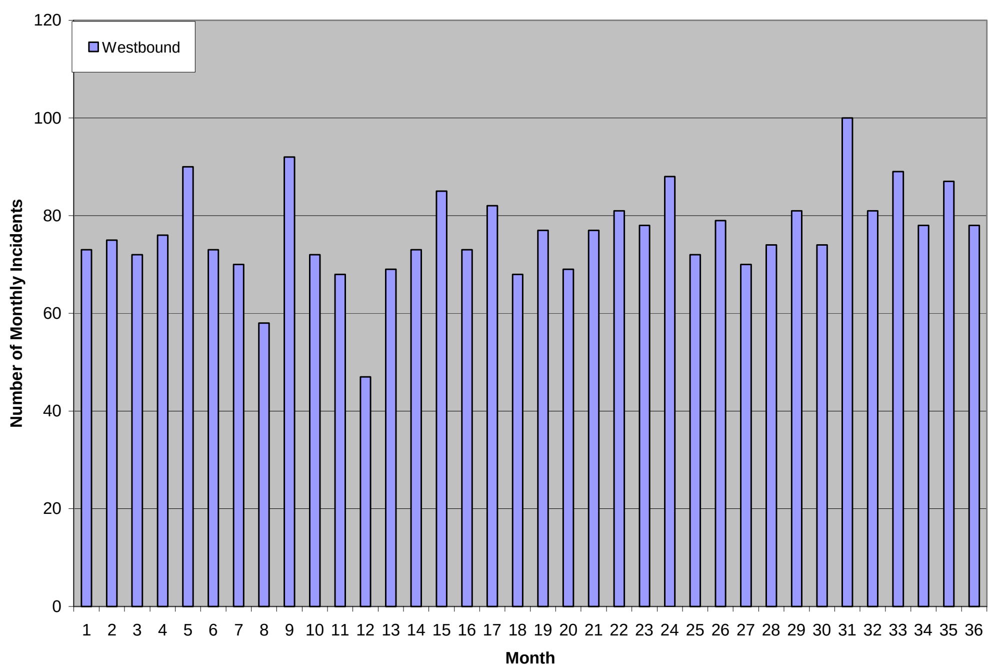


Exhibit 3-25 presents the latest TASAS three year accident data for period from April 1, 2004 through March 31, 2007 for the I-210 corridor from I-5 to the Los Angeles/San Bernardino County Line, as provided by Caltrans. Total number of accidents by type (fatality, injury, and property damage only (PDO), vehicle miles of travel, and the accident rate by type are provided. As indicated in this exhibit, the I-210 corridor experienced lower accident rates in both fatalities and injuries as compared to the average rates experienced by similar roadway facilities.

Exhibit 3-25: Total Number of Accidents by Type and Accident Rate (2004-2007)

		Number of Accidents					Accident Rates					
							Actual			Average		
From	To	Fat	Inj	PDO	Total	MVM	Fat	F+I	Total	Fat	F+I	Total
Eastbound												
I-5 (Golden State Freeway)	San Bernardino County Line	22	955	2110	3087	5086.64	0.004	0.19	0.61	0.005	0.29	0.93
Westbound												
San Bernardino County Line	I-5 (Golden State Freeway)	19	1065	2257	3341	5086.64	0.004	0.21	0.66	0.005	0.29	0.93

Note: Accident rates expressed as # of accidents/Million Vehicle Miles (MVM)

PRODUCTIVITY

Productivity is a system efficiency measure used to analyze the capacity of the corridor, and is defined as the ratio of output (or service) per unit of input. In the case of transportation, it is the amount of people served divided by the level of service provided. Specific to highways, the input to the system is the capacity of the roadways; in transit, it is the number seats provided. For corridor analyses, productivity is defined as the percent utilization of a facility or mode under peak conditions. The highway productivity performance measure is calculated as actual volume divided by the capacity of the highway. Travel demand models do not generally project capacity loss for highways, but detailed micro-simulation tools can forecast productivity.

For highways, productivity is particularly important because where capacity is needed the most, the lowest “production” from the transportation system often occurs.

This loss in productivity example is illustrated in Exhibit 3-26. As traffic flow increase to the capacity limits of a roadway, speeds decline rapidly and throughput drops dramatically. This loss in throughput is the lost productivity of the system. There are a few ways to estimate productivity losses. Regardless of the approach, productivity calculations require good detection or significant field data collection at congested locations. One approach is to convert this lost productivity into “equivalent lost lane-miles.” These lost lane-miles represent a theoretical level of capacity that would have to be added in order to achieve maximum productivity. For example, losing six lane-miles implies that adding a new lane along a six-mile section of freeway would improve productivity. Equivalent lost lane-miles is computed as follows (for congested locations only):

$$LostLaneMiles = \left(1 - \frac{ObservedLaneThroughput}{2000vphpl}\right) \times Lanes \times CongestedDis\tan ce$$

Exhibits 3-27 summarize the productivity losses on the I-210 corridor for the three years analyzed for the respective directions of travel.

Exhibit 3-26: Lost Productivity Illustrated

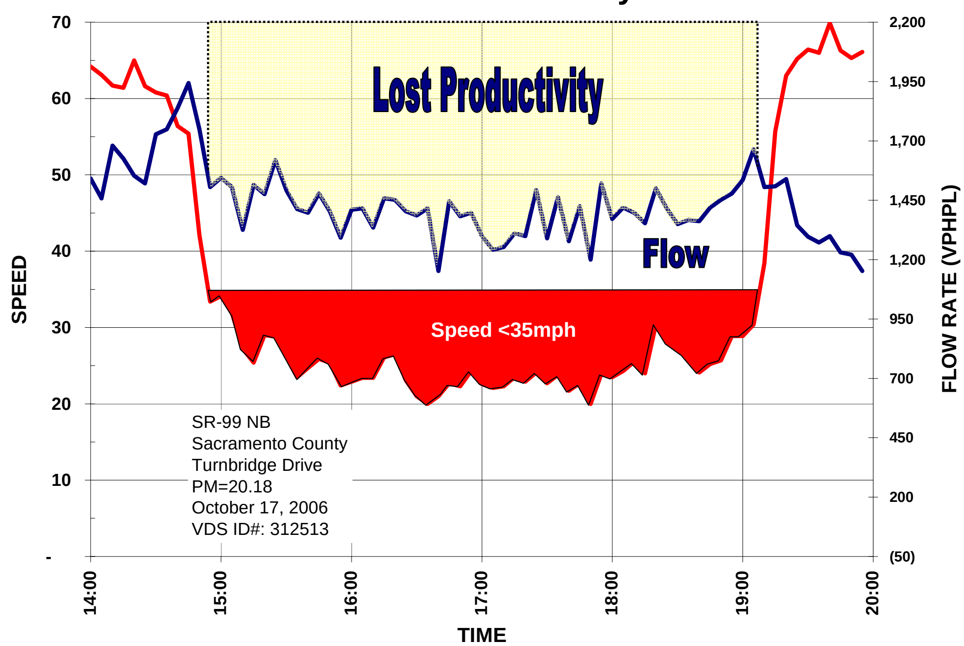
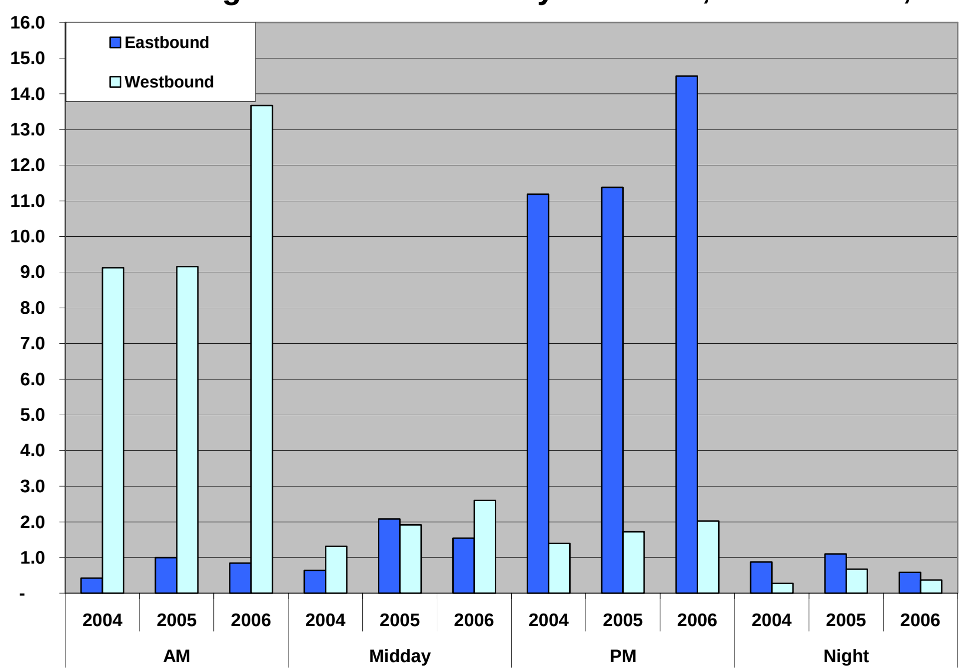


Exhibit 3-27: Average Lost Lane Miles by Direction, Time Period, and Year



4. BOTTLENECK ANALYSIS

In this section of the report, the results of the bottleneck analysis are presented. The bottleneck analysis was conducted to identify potential bottleneck locations. Potential freeway bottleneck locations that create mobility constraints are identified and documented, and their relative contribution to corridor-wide congestion is reported.

A variety of sources were used to identify bottlenecks. They include the following:

- Caltrans Highway Congestion Monitoring Program (HICOMP) 2006 report;
- Probe vehicle runs (electronic tach runs)
  - *Caltrans District 7 tach runs*
- Freeway Performance Measurement System (PeMS)
  - *Speed contour plots*
  - *Flow data; and*
- Aerial photos (Google Earth) and Caltrans photologs
- Field observations

Exhibit 4-1 provides a summary of the bottlenecks identified from the analysis of the various sources. Each bottleneck was verified in separate field observations made on a normal weekday in November and December 2007, and February and May 2008.

Exhibit 4-1: Summary of Bottlenecks Identified and Verified

	Bottleneck Area Post Mile Range		**HICOMP [a] Report**		**Caltrans [b] Probe Veh. Runs**		**PeMS [c] Speed Contours**		**Field [d] Observations**	
BOTTLENECK LOCATION	**ABS**	**CT**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
WESTBOUND										
Azusa on to Vernon off	40.1/39.4	R39.8/39.1	✓	-	✓	-	✓	✓	✓	✓
Irwindale on to I-605 off	38.3/36.8	R38.0/36.5	-	-	✓	-	✓	✓	✓	✓
Santa Anita on to Baldwin off	32.0/31.3	R31.7/31.0	-	-	✓	-	✓	✓	✓	✓
Baldwin on to Michillinda off	31.0/30.3	R30.7/30.0	-	-	-	-	✓	✓	✓	✓
Rosemead on to Sierra Madre off	29.7/29.4	L29.7/R29.4	✓	-	✓	-	✓	✓	✓	✓
Altadena on to Allen off	28.0/27.6	R28.1/27.7	-	-	-	-	✓	✓	✓	✓
Lake on to SR-134 off	26.1/25.5	R26.1/25.5	✓	-	✓	-	✓	✓	✓	✓
SR-134 to SR-118 off	25.5/6.4	R25.5/6.4	-	-	-	-	na	na	-	-
SR-118 on to Maclay off	5.9/5.0	R5.9/5.0	-	-	-	-	na	na	-	✓
Maclay on to I-5	4.8/0.0	R4.8/0.0	-	-	-	-	na	na	-	-
EASTBOUND										
I-5 to Mountain	0.0/24.2	R0.0/24.2	-	-	-	-	na	na	-	-
Mountain on to Fair Oaks	24.2/25.0	R24.2/25.0	✓	-	-	-	✓	✓	-	-
Lake on to Hill off	26.5/26.8	R26.5/26.8	-	-	-	-	-	✓	-	✓
Sierra Madre on to Madre off	28.7/29.1	R28.7/29.1	-	✓	-	-	-	-	-	✓
Rosemead on to Baldwin off	29.4/31.0	R29.4/30.7	-	-	-	✓	-	-	-	✓
Santa Anita on to Huntington off	32.4/33.0	R32.1/32.7	-	-	-	✓	-	✓	-	✓
Mountain on to I-605 off	35.5/36.6	R35.2/36.3	-	✓	-	✓	-	✓	-	✓
Irwindale on to Vernon off	38.3/39.0	R38.0/38.7	-	-	-	✓	-	-	-	-
Azusa on to Citrus off	40.1/40.7	R39.8/40.4	-	-	-	-	✓	✓	✓	✓
Citrus on to Grand off	40.5/41.6	R40.2/41.3	-	✓	-	✓	-	✓	-	✓
SR-57 on to San Dimas off	44.6/45.6	R44.3/45.3	-	-	-	✓	✓	✓	✓	✓

NOTES:
[a] Based on 2006 HICOMP report.
[b] Based on Caltrans District 7 sample probe vehicle runs, taken in March/May 2002.
[c] Based on Performance Measurement System (PeMS) sample daily speed contours taken from April & November 2006, and 2006 quarterly weekday averages.
[d] Based on field observations made on typical non-holiday weekdays in November and December 2007, and in February and May 2008.
na Data not available
\- No indication of bottleneck from this source.

ANALYSIS DETAILS

HICOMP

In review of the Caltrans Highway Congestion Monitoring Program (HICOMP) 2006 report, potential problem areas are initially identified. As illustrated in Exhibit 4-2 and 4-3, the downstream end of congested segments could potentially be bottleneck areas in the westbound direction, as outlined in blue circles, and in the eastbound direction, as outlined in red circles.

- As indicated, in the AM peak there are potentially three major bottlenecks in the westbound direction and one major bottleneck in the eastbound direction:
    - SR-39/Azusa (WB)
    - Foothill Boulevard (WB)
    - Lake Avenue (WB)
    - SR-134 (EB)
- In the PM peak, there are potentially three major bottlenecks in the eastbound direction and none in the westbound direction:
    - Sierra Madre Boulevard (EB)
    - Mountain Ave/I-605 (EB)
    - Citrus Avenue (EB)

Further analysis would be needed, however, to determine their actual locations and possibly any other bottlenecks along the corridor not identified in the HICOMP. The review of the HICOMP provides a good starting point to keep in mind of the congested areas and possible bottleneck locations as more detailed analysis is conducted.

Exhibit 4-2: 2006 HICOMP AM Congestion Map with Potential Bottlenecks

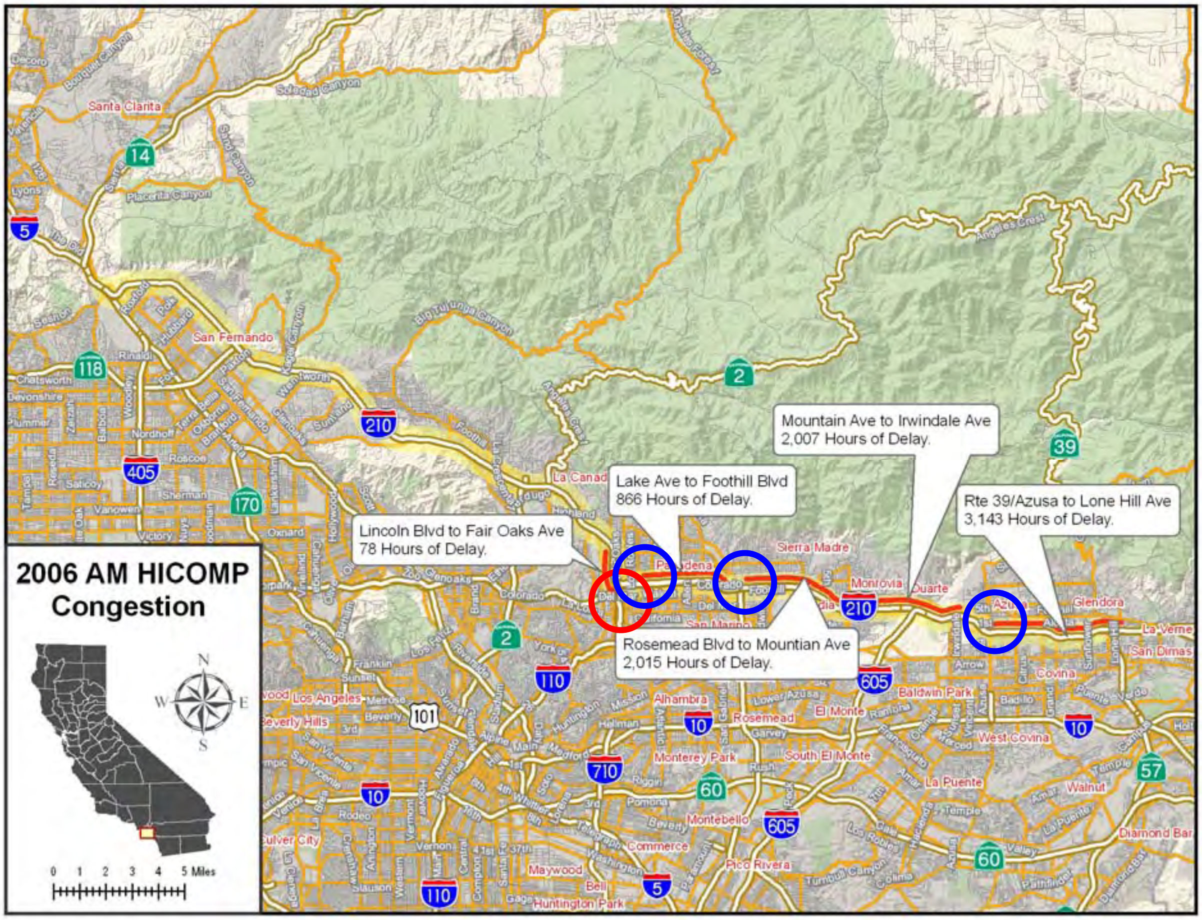
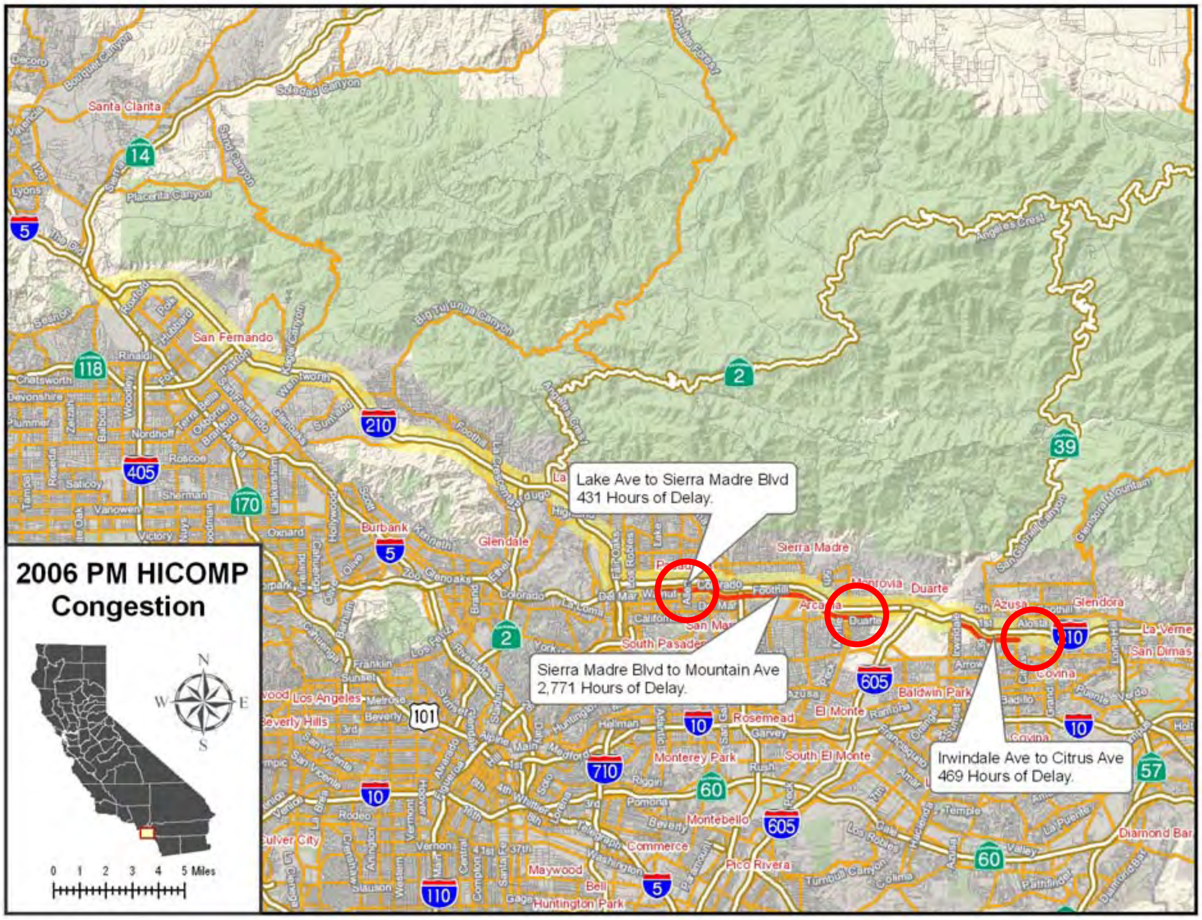


Exhibit 4-3: 2006 HICOMP PM Congestion Map with Potential Bottlenecks



Probe Vehicle Runs

The probe vehicle runs (electronic tach runs) provide speed plots across the corridor at various departure times. A vehicle equipped with an electronic (GPS or tachograph) device is driven along the corridor at various departure times, typically in a middle lane, during the peak period, at regular, 20 to 30 minute intervals. Actual speeds are recorded as the vehicle traverses the corridor length. Bottlenecks can be found at the end of a slow congested speed location where speeds pick up to 30 miles per hour to 50 miles per hour.

Caltrans District 7 collected probe vehicle run data in March and May of 2002, their most recent data available, for the I-210 from Calgrove Boulevard (north of I-5) to Foothill Boulevard (east of SR-57). Exhibit 4-4 illustrates the westbound probe vehicle runs at 7AM, 7:30AM, and 8AM. Exhibit 4-5 illustrates the I-210 eastbound probe vehicle runs, from Foothill to I-5, at 4PM, 5PM, and 6PM conducted on March/May 2006. No speeds below 35 miles per hour were reported in the westbound direction during the PM peak hours or in the eastbound direction during the AM peak hours.

Exhibit 4-4: WB-210 Sample Probe Vehicle Runs

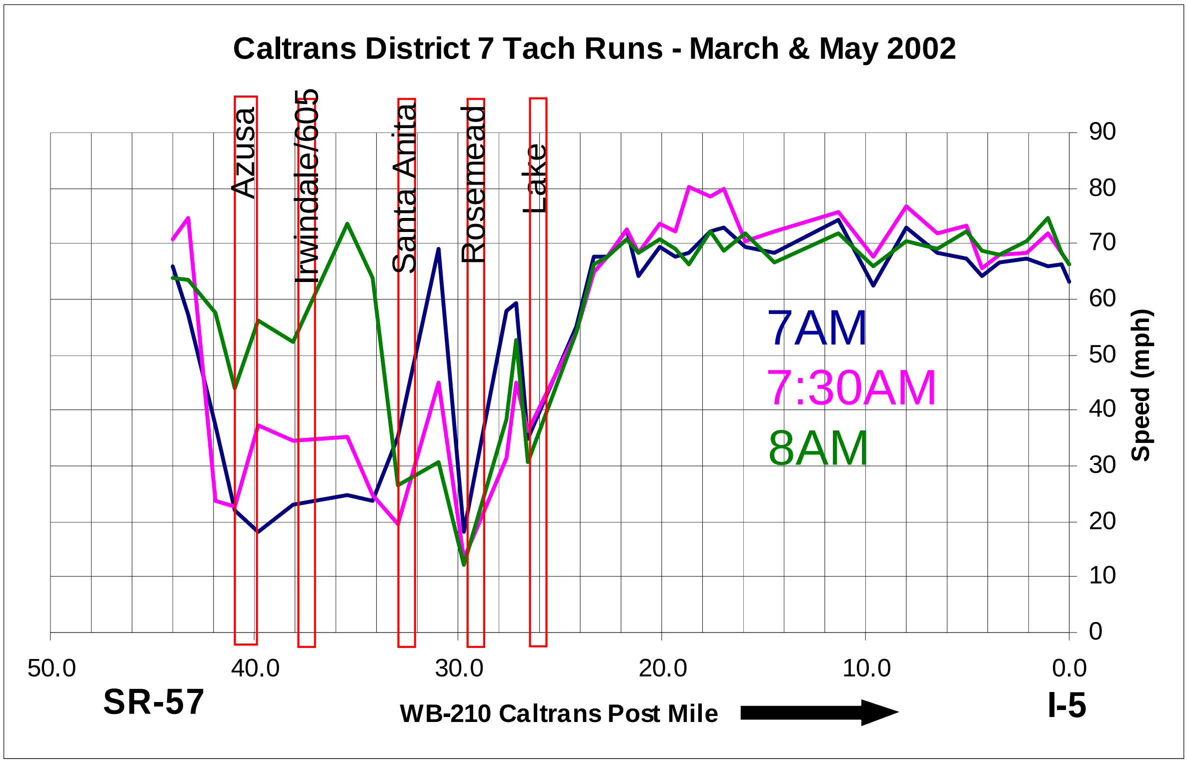
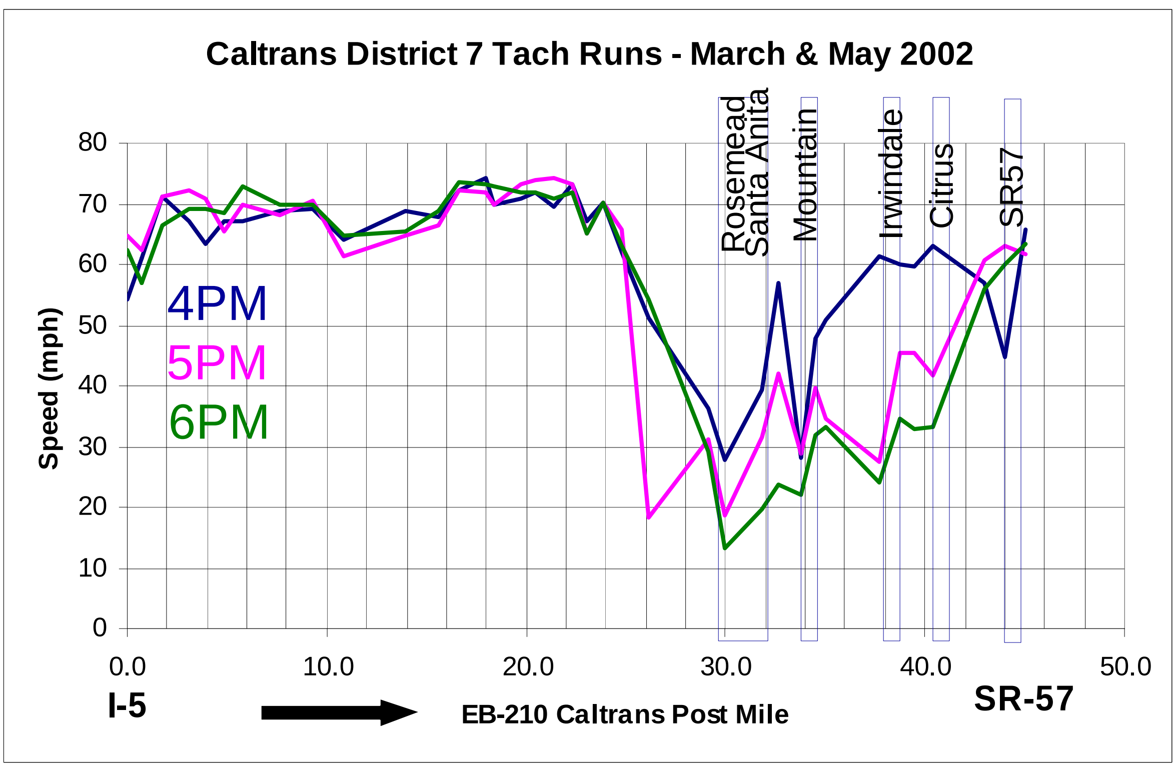


Exhibit 4-5: EB-210 Sample Probe Vehicle Runs



- As indicated, major <u>westbound</u> bottlenecks from the probe vehicle runs were identified at:
  - Azusa on
  - Irwindale/I-605
  - Santa Anita on
  - Rosemead on
  - Lake on

- As indicated, major <u>eastbound</u> bottlenecks from the probe vehicle runs were identified at:
  - Rosemead on
  - Santa Anita on
  - Mountain/I-605
  - Irwindale on
  - Citrus on
  - SR-57 on

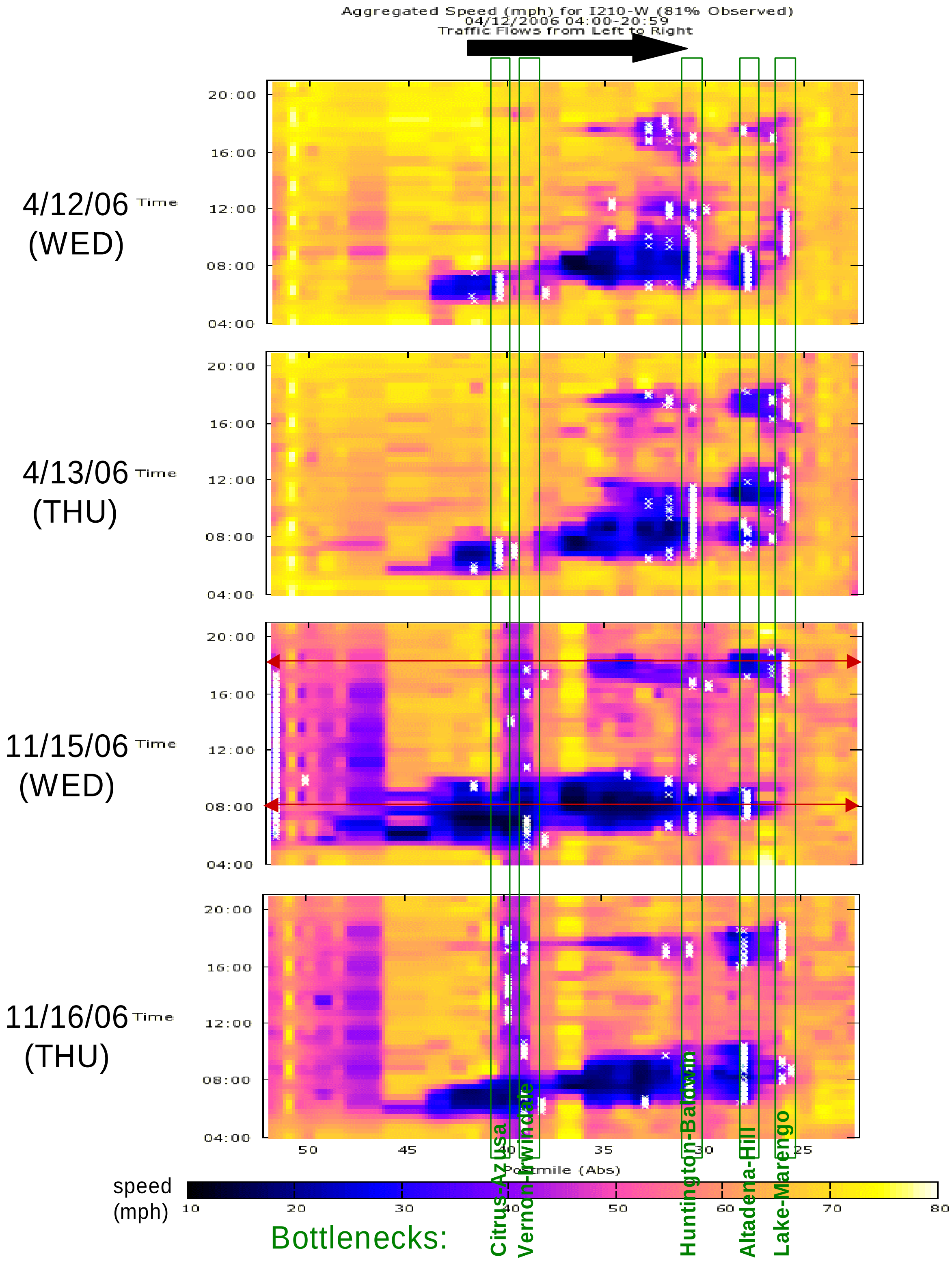
Freeway Performance Measurement System (PeMS)

In PeMS, speed plots are also used to identify potential bottleneck locations. Speed plots are very similar to probe vehicle run graphs. Unlike the probe vehicle runs, however, each speed plot has universally the same time across the corridor. For example, an 8AM plot includes the speed at one end of the corridor at 8AM and the speed at the other end of the corridor also at 8AM. With probe vehicle runs, the end time, or time at the end of the corridor is the departure time plus the actual travel time. Despite this difference, they both identify the same problem areas. These speed plots are then compiled at every five minutes and presented in speed contour plots.

<u>WESTBOUND</u>

Exhibit 4-6 illustrates the speed contour plots on Wednesday, April 12, 2006 and November 15, 2006, and Thursday, April 13, 2006 and November 16, 2006. These speed contour plots represent typical weekday samples to illustrate repetitive pattern in the bottleneck locations and congestion formed from them. The four sample days had observed or “good” detection data that ranged from 73% (November 16, 2006) to 87% (April 13, 2006), providing reasonably accurate results.

Exhibit 4-6: PeMS WB-210 Speed Contour Plots – April/November 2006

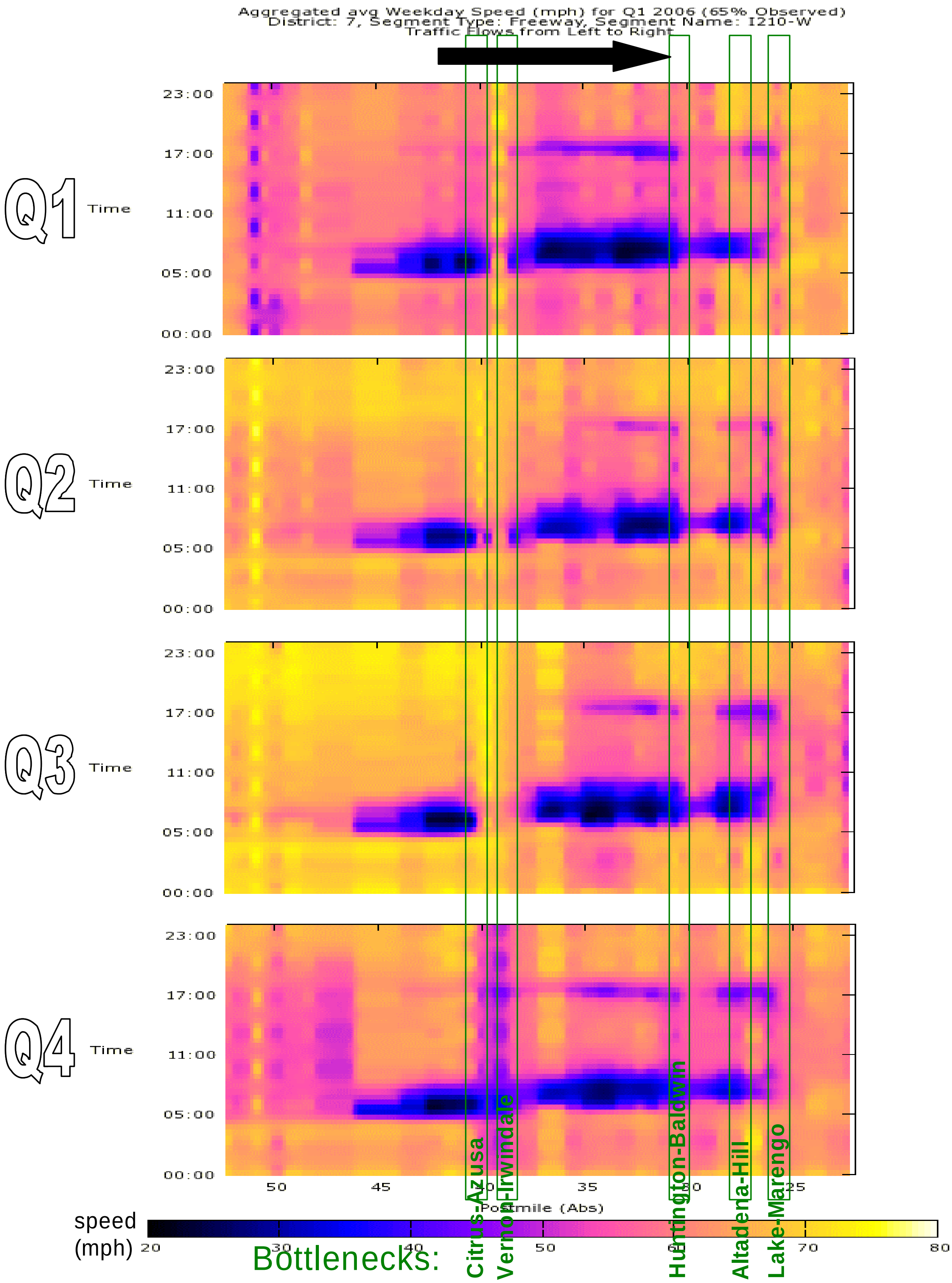


These speed contour plots illustrate the typical speed contour diagram for the I-210 freeway in the westbound direction (traffic moving left to right on the plot). Along the vertical axis is the time period from 4AM to 8PM. Along the horizontal axis is the corridor segment from east of SR-57 to west of SR-134. The various colors represent the average speeds corresponding to the color speed chart shown below the diagram. As shown, the dark blue blotches represent congested areas where speeds are reduced. The ends of each dark blotches represent bottleneck areas, where speeds pickup after congestion, typically to 30 to 50 miles per hour in a relatively short distance. The horizontal length of each plot is the congested segment, queue lengths. The vertical length is the congested time period.

- Based on these contour plots of typical weekday samples in April and November 2006, the following bottlenecks were identified in the westbound direction:
    - Azusa on
    - Irwindale/I-605
    - Santa Anita on
    - Baldwin on
    - Rosemead on
    - Altadena on
    - Lake on

In addition to multiple days, larger averages were also analyzed. Exhibits 4-7 illustrate weekday averages by each quarter of 2006. The same bottleneck locations are identified. From the long contours, the same bottlenecks are evident.

Exhibit 4-7: PeMS WB-210 Long (Speed) Contours – 2006 by Quarter



EASTBOUND

Similarly, speed contour plots for the same sample days and 2006 quarterly weekday average long contours were analyzed for the eastbound direction. Exhibit 4-8 and Exhibit 4-9 illustrate the speed contour plots for the I-210 freeway corridor in the eastbound direction (traffic moving left to right on the plot) on four typical weekdays in April and November 2006 and 2006 quarterly weekday average long contours. Along the vertical axis is the time period from 4AM to 8PM. Along the horizontal axis is the corridor segment from west of SR-134 to east of SR-57. The four sample days had observed or "good" detection data that ranged from 65% (November 16, 2006) to 86% (April 13, 2006), providing reasonably accurate results.

- Based on these contour plots of typical weekday samples in April and November 2006, the following bottlenecks were identified in the eastbound direction:

    - SR-134
    - Lake on
    - Huntington off
    - I-605 off
    - Azusa on
    - SR-57 on

Exhibit 4-8: PeMS EB-210 Speed Contour Plots – April/November 2006

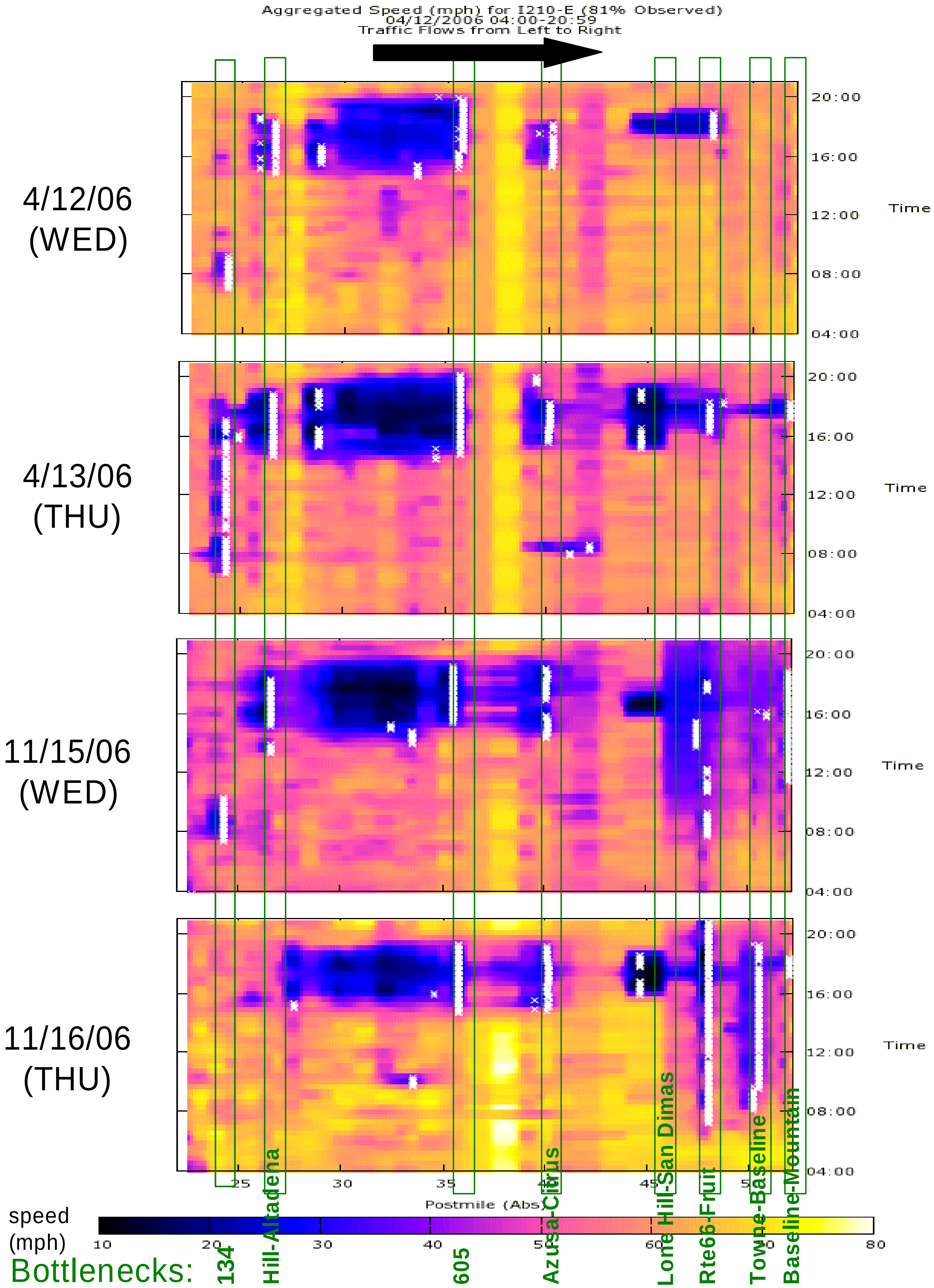
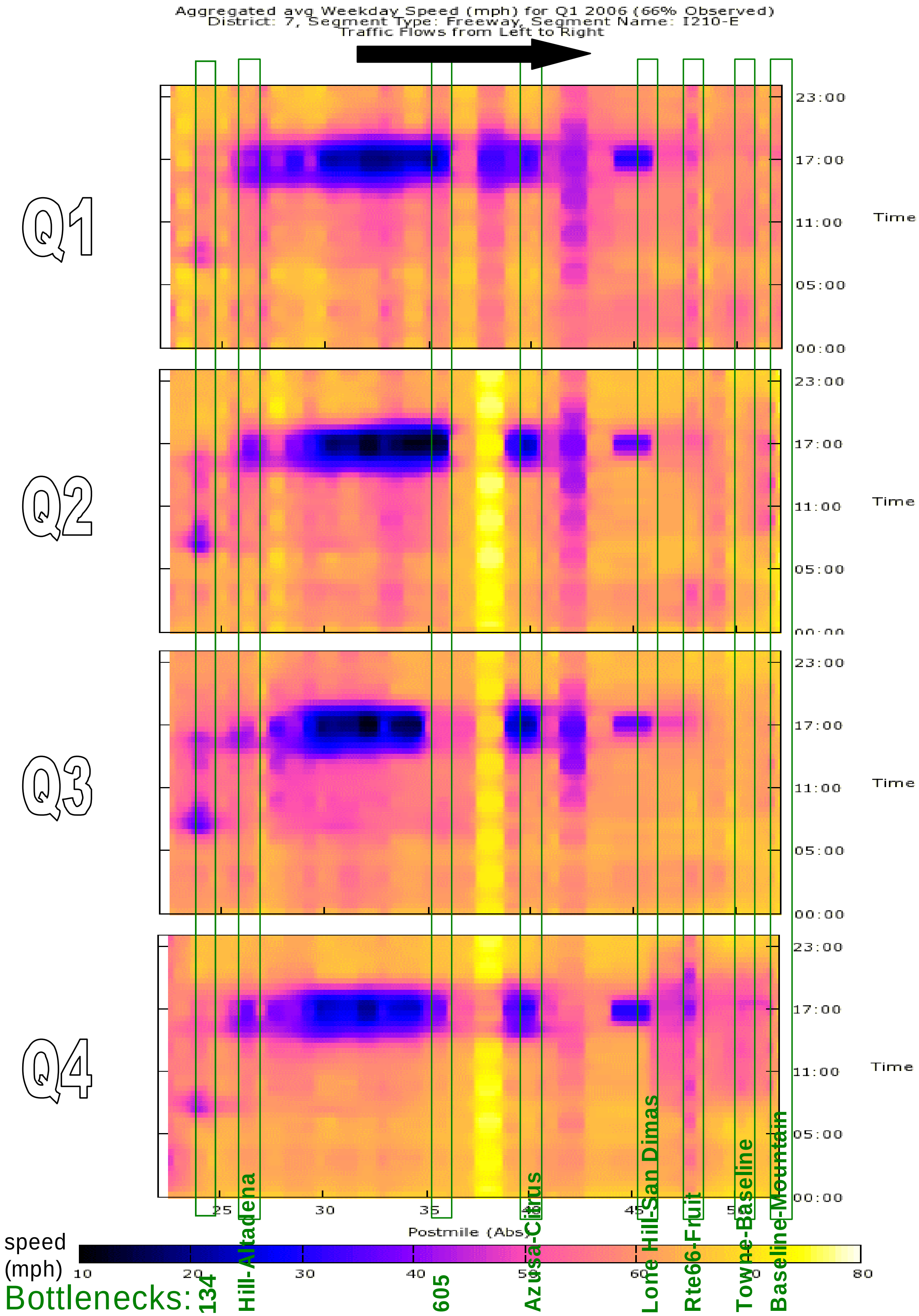


Exhibit 4-9: PeMS EB-210 Long (Speed) Contours – 2006 by Quarter



5. BOTTLENECK CAUSALITY

Simply stated, by definition, a bottleneck is a condition where traffic demand exceeds the capacity of the roadway facility. The causes in most cases is either a sudden reduction in capacity for various reasons, such as roadway geometry, heavy merging and weaving, and driver distractions, or a surge in demand that the facility cannot accommodate. In many cases, it is a combination of demand increases and capacity reductions. Below is a summary of the causes of the bottleneck locations.

WESTBOUND BOTTLENECKS AND THEIR CAUSES

Westbound bottlenecks and congestion were mostly in the AM peak hours, although evidence of the same bottlenecks to a lesser degree was found in the PM peak hours.

<u>Azusa on to Vernon Off</u>

Exhibit 5-1 is an aerial photograph of the westbound I-210 mainline approaching Azusa on-ramp. As shown, the roadway has a large horizontal curve to the right. The primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Azusa merging into the freeway traffic at the crest of the curve. Combined, the two ramps exceed 1,000 vehicles per hour during AM peak hours, even with ramp metering. The mainline traffic must negotiate the long turn and accommodate the merging traffic from consecutive ramps.

Exhibit 5-1: Westbound I-210 at Azusa

Irwindale on to I-605 Off

Exhibit 5-2 is an aerial photograph of the westbound I-210 mainline between Irwindale and I-605. As shown, the roadway here also has a large horizontal curve to the right. The primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Irwindale merging into the freeway traffic, compounded by mainline traffic weaving to get into the outside lanes in order to exit at I-605 connector. Combined, the two ramps exceed 800 vehicles per hour during AM peak hours, even with ramp metering.

Exhibit 5-2: Westbound I-210 at Irwindale and I-605

Santa Anita on to Baldwin Off

Exhibit 5-3 is an aerial photograph of the westbound I-210 mainline between Huntington and Santa Anita. As shown, the roadway here has multiple large horizontal curves. The primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Santa Anita merging into the freeway traffic at the crest of the curve. Combined, the two ramps exceed 900 vehicles per hour during AM peak hours, even with ramp metering. The mainline traffic must negotiate the long turn and accommodate the merging traffic from consecutive ramps. The lower photo shows the backup traffic in all lanes at Huntington. The upper photo shows the right two lanes congested while the inner lanes begin to move faster and separate. This indicates that the ramp traffic merging is affecting the mainline traffic flow.

Exhibit 5-3: Westbound I-210 at Santa Anita

Baldwin on to Michillinda off

Like most of the other locations, the primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Baldwin (North and South Baldwin) merging into the freeway traffic. Combined, the two ramps exceed 900 vehicles per hour during AM peak hours, even with ramp metering.

Rosemead on to Sierra Madre Villa off

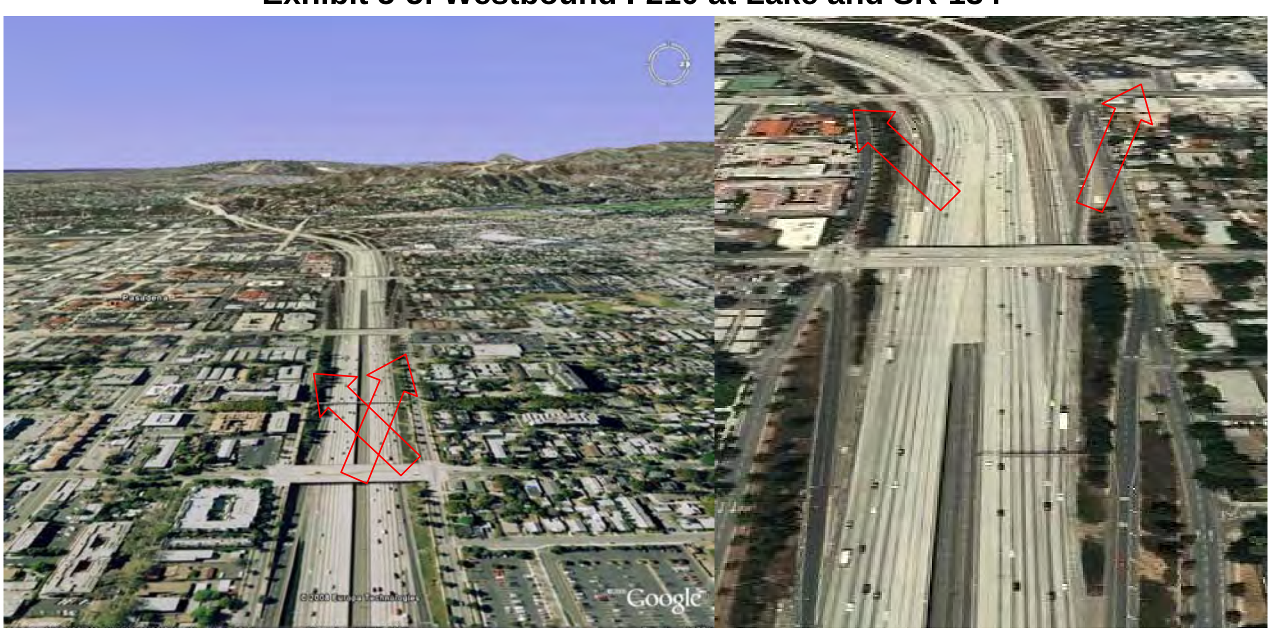
The primary cause of this bottleneck is the heavy traffic from three consecutive on-ramps from Michillinda, Foothill, and Rosemead merging into the freeway traffic, compounded by the weaving from traffic exiting at Sierra Madre Villa. Combined the three ramps exceed 1,700 vehicles per hour during AM peak hours, even with ramp metering. Exhibit 5-4 illustrates this location.

Exhibit 5-4: Westbound I-210 at Rosemead

<u>Lake on to SR-134 off</u>

The primary cause of this bottleneck is the weaving between the heavy traffic from the Lake on-ramp and exiting traffic to I-210 west. Lake on-ramp exceeds 700 vehicles per hour during AM peak hours, even with ramp metering. Exhibit 5-5 illustrates this location.

Exhibit 5-5: Westbound I-210 at Lake and SR-134



<u>SR-118 on to Maclay Street off</u>

The primary cause of this bottleneck is the heavy SR-118 freeway on-ramp traffic merging with the I-210 mainline traffic during the PM peak hours. The eastbound SR-118 freeway terminates at this I-210 junction. Two connector lanes to westbound I-210 merge into one and enter the freeway. The I-210 mainline facility cannot handle the heavy demand and platoon of vehicles from this connector. Exhibit 5-6 illustrates this location. The bottom photograph illustrates the light volume on the westbound I-210 mainline approaching the SR-118 interchange. The middle photograph illustrates the congestion and queuing resulting from the SR-118 connector on-ramp merging. To make matters worse, the fourth lane (provided from the connector on) is dropped after the Maclay Street off-ramp, as shown on the top photograph. It also shows the clearing of the congestion past the Maclay Street interchange.

Exhibit 5-6: Westbound I-210 at SR-118

EASTBOUND BOTTLENECKS AND THEIR CAUSES

The eastbound bottlenecks and congestion were mostly in the PM peak hours, although evidence of some of the same bottlenecks to a lesser degree was found in the AM peak hours. Below is a summary of the causes of the bottleneck locations.

<u>Mountain on to Fair Oaks</u>

Exhibit 5-6 is an aerial photograph of the eastbound I-210 mainline approaching the SR-134 interchange and the Lincoln tunnel. Most of the traffic is headed either on the eastbound I-210 freeway or the westbound SR-134. The two-lane connector capacity is often inadequate to accommodate the demand. As a result, significant congestion and queuing occurs from this location, mostly in the AM peak hours but sometimes even in the PM peak hours. Congestion and queuing is accentuated on days preceding major holiday weekends.

Exhibit 5-6: Eastbound I-210 at SR-134/Lincoln Tunnel

<u>Lake on to Hill Off</u>

The primary cause of this bottleneck is the heavy traffic from Lake on-ramp that the mainline facility cannot accommodate the surge in demand. The Lake on-ramp often exceeds 900 vehicles per hour during PM peak hours, even with ramp metering.

San Gabriel on to Madre Off

The primary cause of this bottleneck is that the mainline capacity at this location cannot accommodate the increase in demand from the San Gabriel on-ramp, although the demand is modest at less than 600 vehicles per hour with ramp metering. There is a large reversing horizontal curve, to the right at San Gabriel and then left at Madre; however, an auxiliary lane is provided between the two interchanges with sufficient distance to allow for easier merging and weaving.

Rosemead on to Baldwin off

The primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Rosemead and Michillinda merging into the freeway traffic. Although the ramp volumes are very modest at less than 400 vehicles per hour combined, the mainline facility cannot accommodate the additional demand since the mainline traffic is near or at the threshold levels

Santa Anita on to Huntington Off

Exhibit 5-7 is an aerial photograph of the eastbound I-210 mainline between Santa Anita and Huntington. As shown, the roadway here has multiple large horizontal curves with narrowing effect through this segment. Given the geometric conditions, the mainline cannot accommodate the additional demand from the Santa Anita and Huntington ramps.

Exhibit 5-7: Eastbound I-210 at Santa Anita/Huntington

<u>Mountain on to I-605 Off</u>

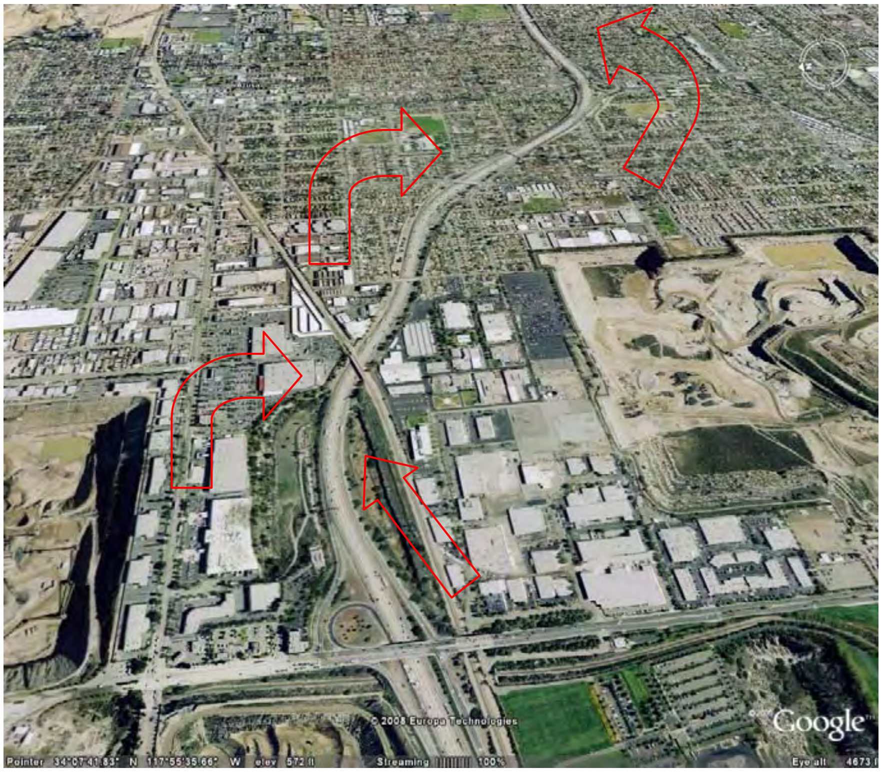
Exhibit 5-8 is an aerial photograph of the eastbound I-210 mainline approaching the I-605 interchange. The primary cause of this bottleneck is the heavy traffic from two consecutive on-ramps from Mountain and Buena Vista merging into the freeway traffic, compounded by mainline traffic weaving to get into the outside lanes in order to exit at I-605 connector. Combined, the two ramps exceed 1,200 vehicles per hour during PM peak hours, even with ramp metering. The photo illustrates the heavy traffic and difficulty in weaving.

Exhibit 5-8: Eastbound I-210 at I-605 Off

<u>Irwindale on to Vernon Off</u>

Exhibit 5-9 is an aerial photograph of the eastbound I-210 mainline between Irwindale and Azusa. As shown, the roadway here has multiple large horizontal curves. The primary cause of this bottleneck is the heavy traffic from the Irwindale on-ramp combined with the curvature of the roadway. Irwindale on-ramp exceeds 700 vehicles per hour during AM peak hours, even with ramp metering. The mainline traffic must negotiate the long turn and accommodate the merging traffic from ramp.

Exhibit 5-9: Eastbound I-210 at Irwindale



Azusa on to Citrus off, Citrus on to Grand off, and SR-57 on to San Dimas off

The primary cause of these bottlenecks is the added demand from the ramps exceeding the available capacity of the mainline facility. The mainline traffic is at or near the threshold levels during the PM peak hours and cannot accommodate the additional demand.